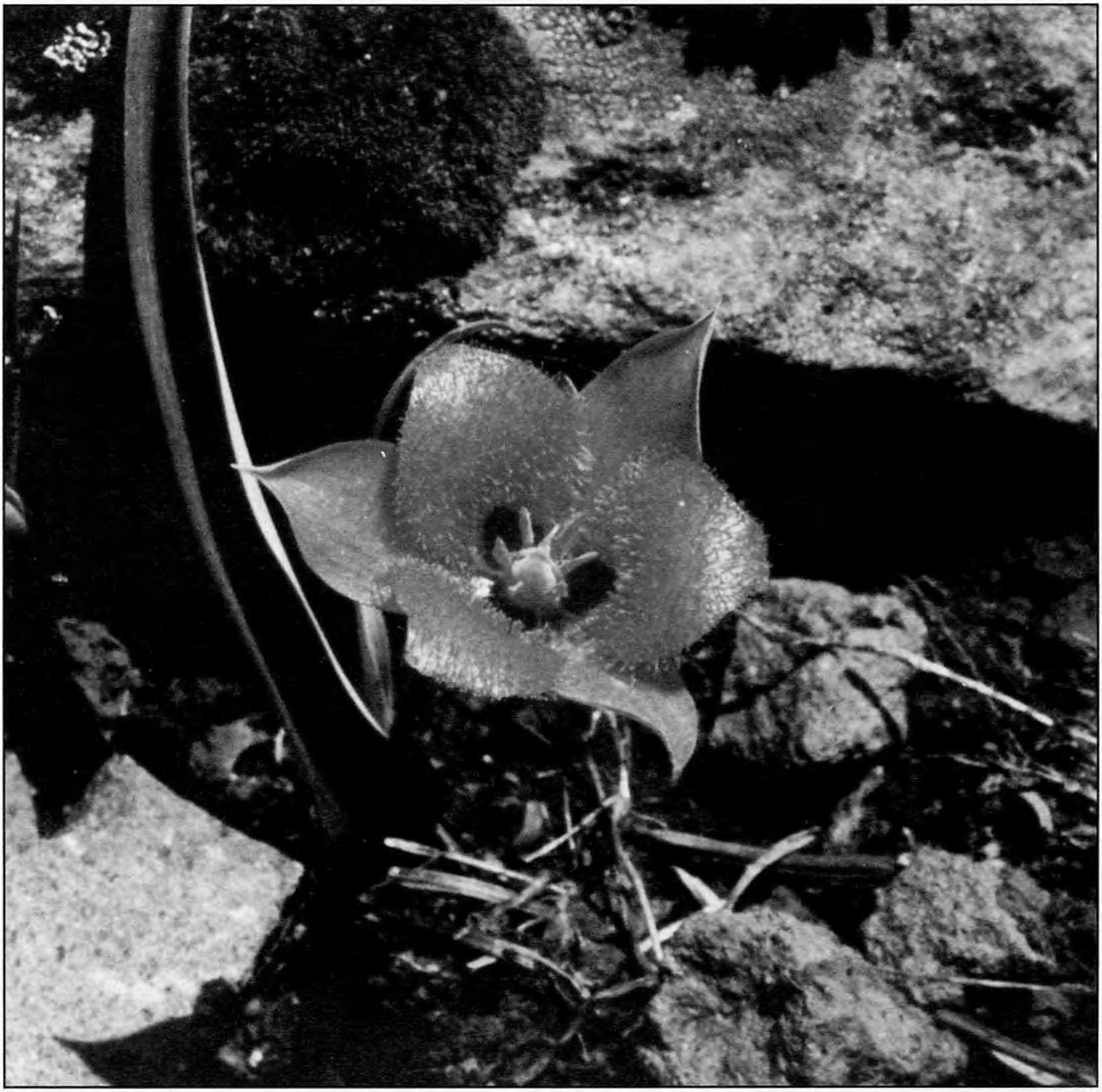
KALMIOPSIS

Journal of the Native Plant Society of Oregon



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KALMIOPSIS

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Native Plant Society of Oregon

The Native Plant Society of Oregon is an organization of lay and professional botanists interested in Oregon flora. The work of the Society includes preservation of native flora and the botanical education of Society members and the public. The Society accomplishes the former goal by taking an active role in monitoring programs, by active participation in plant conservation issues, by helping establish botanical preserves and by protecting significant plant populations. We meet our educational goals through our local chapter meetings, field trips, and publications. The Society awards the Jean M. Davis Memorial Scholarship to students studying Oregon flora and awards several modest research grants yearly. Membership includes participation in local chapter meetings, field trips, and subscriptions to the BULLETIN and KALMIOPSIS (also available separately at $5.00 per issue). The monthly BULLETIN includes notices of chapter meetings and activities, conservation issues and short articles of interest to the membership. KALMIOPSIS features longer articles of interest to lay and professional members of the Society.

Volunteers do the work of the Society. Money is raised by membership dues, and sale of posters, notecards, and tee shirts. Additional donations, bequests, and memorial gifts greatly help the Society in its efforts.

THE COVER

Yellow star-tulip, *Calochortus monophyllus* (Lindley) Lemaire, is known only from Grizzly Peak, Jackson County, Oregon, the Cascade Range Foothills and the north and central Sierra Nevada Foothills in California. Frank Lang photograph.

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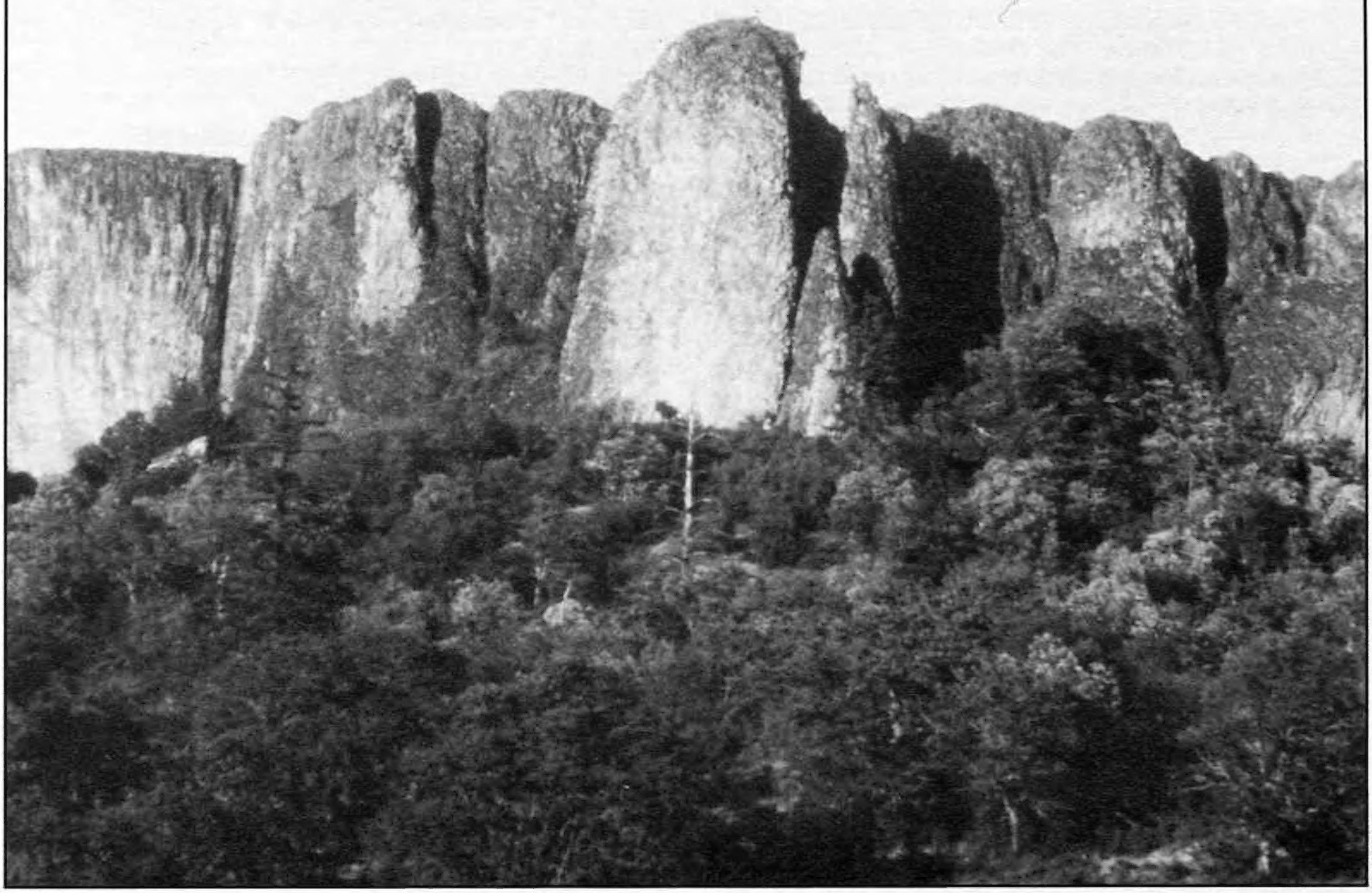
ERRATA

V2 1992, p. 19 — Replace *Gentiana setosa* with *G. setigera* and second mention of *G. plurisetosa* with *G. bisetaea*.

OREGON PLANTS, OREGON PLACES: Upper and Lower Table Rocks, Jackson County


BORGIAS

By JOAN SEEVERS and DARREN BORGIAS

Two prominent mesa buttes, Upper and Lower Table Rocks, rise abruptly above the north bank of the Rogue River in Jackson County, Oregon, just north of Medford. The Rocks are a popular destination for wildflower lovers in spring and hikers all year. The vista from the top is spectacular. Mt. McLoughlin dominates the young volcanic Cascade Range to the east. To the south and west are the venerable and geologically complex Siskiyou Mountains. The forested mountains of the Rogue-Umpqua Divide to the north complete the view. The Rocks offer a remarkable combination of native plant communities, endemic wild flowers, unusual animals and interesting geology. The tops of the Rocks, crowned with a distinctive patterned ground—vernal pool landscape, come alive with wildflowers each year as winter gives way to spring.

The 3,300-acre managed natural area on Table Rocks is close to urban areas where local visitors can enjoy nature close to home. The rewards of the 800-foot climb are many. When hikers leave the trailhead on the valley floor in mid-April, an array of wildflowers waits to be enjoyed, studied or photographed on the trail up through oak woodlands. Animal signs are abundant for the trained eye and the eager learner. Over seventy species of animals are known from the Rocks. In the midst of an elegant wildflower show with unbroken views of surrounding peaks and mountains, you know you are at a very special place.

Access To The Rocks

To reach the Table Rocks, take Exit 32 off Interstate 5 in Central Point and proceed east about one mile to Table Rock Road (see map pg. 2). Turn left on Table Rock Rd. Reach Upper Table Rock by turning right onto Modoc Rd. about one mile past Tou Velle State Park on the Rogue River. Travel one and a half miles to the fenced trailhead on the left side of the road. Reach Lower Table Rock by turning west on Wheeler Road about three miles past Tou Velle State Park. Go to the fenced trailhead on the left side of the road. The trails to the summit are muddy in wet weather and steep in places, but are kept clear of poison oak. The trail gains 800 feet in elevation in a mile and a half at Upper Table Rock, two and a half miles at Lower Table Rock. Chemical toilets at the trailheads are the only facilities on the Rocks. Bring your own drinking water. Pets are never allowed on the trails. Bikes, horses, camping, fires and wildflower picking are also prohibited.

Hazards include poison oak, ticks, the occasional rattlesnake, and steep cliff faces. However, with a little care, visitors can have a safe, enjoyable visit.

The trails to the summits of the Rocks traverse similar terrain and plant communities. The flora of the two summits is similar. A list of common plants is provided (pg. 7) along with blooming times for selected species (pg. 9).

Human History

Table Rocks have been important since humans first occupied Rogue River Valley thousands of years ago. Prehistoric sites near Table Rocks suggest that this small area has been used by humans for thousands of years. At the time of European contact, a native American tribe called the Takelma lived here.

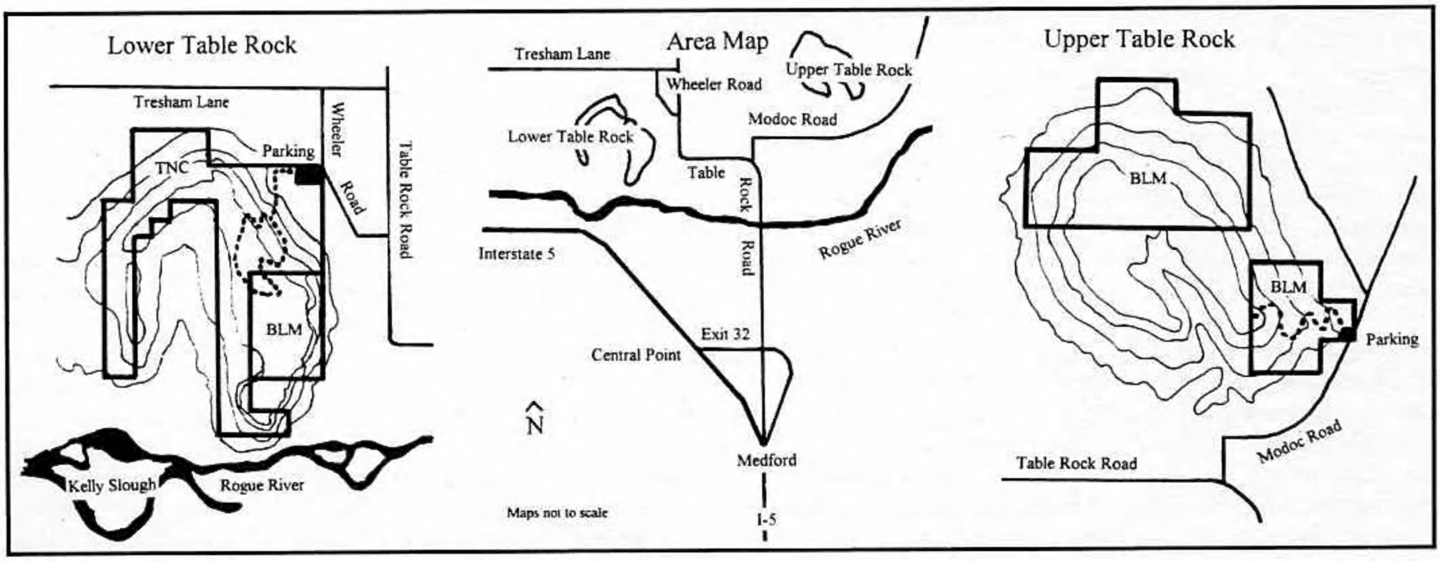
Table Rocks and the nearby Rogue River provided easy access to a variety of resources for food and other necessities. Salmon from the river, and acorns and camas *(Camassia quamash* ssp. *quamash)* from nearby gathering grounds, were the staples of their diet. Acorns of the abundant California black oak *(Quercus kelloggii)* and Oregon white oak *(Q. garryana)* were leached in the river to remove tannic acid and then ground into meal. Klamath plum *(Prunus subcordata)*, common chokecherry *(P. virginiana)*, and wild rose *(Rosa nutkana)* provided fruits for drying. They gathered medicines and materials for tools and basketry.

Hudson's Bay Company fur trappers, led by Peter Skene Ogden, contacted the Takelma and recorded observations of them and their villages near Table Rocks in 1827 (Beckham 1971, LaLande 1983). The quest for gold and land brought miners and settlers pouring into southwestern Oregon by the late 1840s. Conflicts betwen the two cultures escalated into the Rogue Indian Wars. The United States Army built Fort Lane across the river from Lower Table Rock to control the conflict. As fighting continued, Europeans designated Table Rocks as a reservation for the Takelmas and other southern Oregon tribes. Three years later, the remaining 400 Indians were moved to the Siletz Reservation in northern Oregon, ending the traditional Takelma way of life. The army abandoned Fort Lane, and Europeans quickly claimed the reservation land around the Rocks. Many commercial ventures have been proposed or attempted on Table Rocks, from mining to residential development on the summits. The main uses are now recreational and educational with some cattle grazing on Upper Table Rock.

Geology and Physical Environment

The Rocks, shaped like horseshoes in aerial view, are the eroded remnants of an andesite lava flow. The flow is andesite because of its silica content and calcium to magnesium ratio. The flow was formerly thought to be a basalt flow (Wiley, pers. comm. 1993). Recent investigations suggest that the andesite flow originated east of Prospect in the nearby Cascade Range (Wiley, pers. comm. 1993). The flow, radiometrically dated at 9.6 million years (Capps 1992), filled the prehistoric Rogue River canyon carved through the Payne Cliff Formation (Orr et al. 1992). Over millions of years, the surrounding valley floor eroded from the more resistant andesite. The 125-foot thick andesite layer originally filled the valley bottom. It now perches as isolated caps of mesa-buttes 800 feet above the basin floor, a classic example of inverted topography (Capps 1992). These two mesas are notable because their U-shapes preserve the oxbow meanders of the ancient river (Orr et al. 1992). The nearly level surfaces of Table Rocks stretch linearly, in a horseshoe shape for several miles. There are approximately 300 acres of level summit on Lower Table Rock and 500 acres on Upper Table Rock. Both have nearly vertical cliffs in places and display the vertical columnar jointing typical of lava flows. Talus slopes formed below the cliffs from rubble that was frost wedged from above. These high cliffs lend visual diversity to the landscape and are a focal point for observers on the valley floor.

The flat, table-like surface of Table Rocks has patterned ground — broad shallow depressions, round soil mounds and convex stony flats with linear mounds. Hydrologic gradients create a diverse pattern of plant associations that conforms to, and highlights, the microtopography. Vernal pools form in depres-



sions where underlying andesite bedrock prevents the downward movement of rain water. These seasonal wetlands last from the fall rains in late October into early June. Dwarf meadowfoam *(Limnanthes floccosa* ssp. *pumila),* endemic only to the summits of Table Rocks, grows in this seasonally wet habitat.

Patterned ground is a regionally significant landform that occurs only where a shallow layer of soil lies over an impervious substrate or waterlogged basement. Either can create a temporary perched water table (Cox and Scheffer 1991). Cox and Scheffer propose arguments supporting the hypothesis that pocket gophers or other fossorial rodents work the soils to accumulate the mounds. Gophers move an estimated two or more tons of soil per year per animal, and a population may move 47 tons of soil on one acre in a year (Case 1983). Other theories propose seismic tremors (Berg 1990), periglacial freeze-thaw phenomena or wind deposition.

Soils on Table Rocks derive predominantly from colluvium. They range from the extremely plastic and sticky clays through loamier soils. When the rains fall, sticky clay mud around the lower and mid slopes clings tenaciously to boots. Later the soil dries and shrinks, leaving gaping cracks in the surface.

Lying in the rain shadow of the Siskiyou Mountains, the Rogue Valley is the warmest and driest region in Oregon west of the Cascades. Hot, consistently dry summers and mild, wet winters characterize the Rogue Valley's Mediterranean climate. The summits of Table Rocks often are above the low valley fog associated with winter high-pressure systems.

Plant Ecology of Table Rocks

Table Rocks are in the Pacific Northwest Interior Valley Vegetation Zone characterized by oak woodlands, grasslands, and chapparal (Franklin and Dyrness 1988). An Oregon white oak *(Quercus garryana)* savanna community forms the matrix of vegetation at Table Rocks that grades into a mixed woodland of Oregon white oak, California black oak *(Q. kelloggii),* madrone *(Arbutus menziesii),* ponderosa pine *(Pinus ponderosa),* and, to a limited degree, Douglas fir *(Pseudotsuga menziesii).* Chaparral of wedgeleaf ceanothus *(Ceanothus cuneatus)* forms large stands and threads through the savanna and woodlands. Detling (1961), emphasized wedgeleaf ceanothus chaparral, rather than the oregon white oak savanna as the fundamental vegetation of the region because of its widespread occurrence in the landscape and its more restricted range.

The assemblage of plant communities on the Rocks represents a climatic and floristic transition between the more moist Umpqua and Willamette Valleys to the north and warmer California central valleys to the south. While structurally similar, California oak communities differ from those on Table Rocks by replacement of ponderosa pine by digger pine *(P. sabiniana)* as the major conifer (Griffen 1988). An important overlay of grass species from the Great Basin suggests a strong floristic tie between the two areas (Heady 1977). Examples include the eastside bluebunch wheatgrass *(Pseudoroegneria spicata = Agropyron spicatum)* and junegrass *(Koeleria macrantha),* which occur west of the Cascades on Table Rocks and elsewhere.

Franklin and Dyrness (1988) concluded that the nature of the original pre-settlement interior valley grassland communities is strictly conjectural. Livestock grazing and the introduction of non-native species from Europe and the Mediterranean have altered all stands to some degree. Recent classifications of Oregon white oak-dominated woodland communities in the Rogue and Umpqua basins reflect this change. Drier vegetation types are classified by their dominant non-native annual grasses (Smith 1985, Riegel et al. 1992). Several historic perennial bunchgrass communities have been replaced by associations of highly competitive introduced annual grasses (Reigel et al. 1992). Remnant patches of native grass species that aid in reconstructing presettlement communities occur on the Rocks.

Fire has maintained and influenced the grassland, shrub and savanna elements of Table Rocks (Detling 1961, Reigel et al. 1992). Natural fire return intervals are estimated to be from 5-10 years for oak-dominated woodlands and 5-25 years for pine types (Agee 1990). Prior to European settlement, grasslands and savanna burned more frequently than the rate due to lightning strikes. Historical accounts (Wilkes 1849, Lane in Walling 1884, Douglas in Davies 1980) clearly record the role of fire and explain the present landscape of grassland, savanna and woodland. They also show changes in the structure and extent of valley plant communities resulting from the exclusion of fire.

European agriculture in "Chief" Sams Valley between Upper and Lower Table Rocks may have erased evidence of the camas crop the Takelma are thought to have promoted by regular burning. By 1899, a forester for the United States Geological Survey noted that most oaks in the lowlands showed fire scars (Leiberg 1900). Fire suppression in the Rogue Valley resulted in dense stands of oak woodland, mixed oak and conifer woodland, and reduction of chaparral. A halt in the practice of widespread aboriginal burning, combined with post-settlement fire control, curtailed the role of fire and reduced the extent of grasslands and savanna.

BORGIAS

Oregon White Oak Woodland

Plant Communities

The Oregon Natural Heritage Program currently recognizes three communities in the Table Rocks Natural Area (Kagan 1993). These include, from the base to the top of the rock:

the Oregon White Oak Savanna; the Ponderosa Pine - Oregon White Oak - California Black Oak / Manzanita - Buckbrush / California Oatgrass - Idaho Fescue Bunchgrass Savanna; and the Madrone - Oregon White Oak - California Black Oak / Poison Oak Woodland. The summit is covered by what the Nature Conservancy calls Mounded Prairie. While the oak communities can occur as discrete, identifiable units, they tend to blend into one another.

Oregon White Oak Savanna

An open Oregon white oak savanna surrounds the lower flanks of Table Rocks on heavy clay soils. The oak varies in stature and occurs at variable densities. Individuals, often occurring in small clumps, roughly 60 cm (2 feet) dbh may be 130 to nearly 300 years old. Upslope, large relict Oregon white oaks with spreading canopies are interspersed in a dense stand of much younger oaks with narrow canopies. These young stands developed without recurrent ground fires (Habeck 1961, Thelenius 1968).

The savanna understory is a grassland of non-native annual grasses from Europe and the Mediterranean. Medusahead *(Taeniatherum caput-medusae)* is the most common in open grasslands with soft brome *(Bromus hordeacus)* and bulbous blue grass *(Poa bulbosa)*. Under the partial shade of oaks, hedgehog dogtail grass *(Cynosurus echinatus)* becomes the most prevalent. Native perennial bunchgrasses still present are California oatgrass *(Danthonia californica)* and Lemmon's needle grass *(Acnatherum = Stipa lemmonii)*. Common forbs include desert parsley *(Lomatium utriculatum)*, camas *(Camassia quamash)*, and the buttercups *(Ranunculus occidentalis* and *R. austro-oreganus*, a southern Oregon endemic). In early to mid summer, extensive stands of harvest brodiaea *(Brodiaea elegans)* color the grasslands violet.

Ponderosa Pine - Oregon White Oak - California Black Oak / Manzanita - Buckbrush / California Oatgrass - Idaho Fescue Bunchgrass Savanna

The pine-oak savanna blends with components of oak savanna, madrone woodlands, and the chaparral formation. Species diversity and density of trees and shrubs increase on slopes with more loamy soils. Pine and California black oak are important components of this savanna community with scattered Douglas fir that are seeding in, due to lack of fire.

The understory of pine-oak savanna is varied. On the shallower cobbly soils below the andesite cliffs, variable sized patches of buckbrush and white-leaf manzanita *(Arctostaphylos viscida)* occur. In early April, profuse cream-white flowers of the buckbrush saturate the air with their slightly musky, sweet scent. Poison oak *(Toxicodendron diversilobum)*, service berry *(Amelanchier alnifolia)*, snowberry *(Symphoricarpos albus)*, and the trailing honeysuckle *(Lonicera hispidula)* are important components of the pine-oak community. Stands of mountain mahogany *(Cercocarpus betuloides)* occur within the predominant oak community on east and north slopes. Stands of Fremont's silk tassel bush *(Garrya fremontii)* often grow in fully-exposed, rocky soils.

Under the partial shade of oak, native bunchgrasses predominate over non-native annual grasses. Idaho fescue *(Festuca idahoensis)* is more important on the shallow slopes and is protected under the shade of oaks. Concavities and benches often support California oatgrass *(Danthonia californica)*. Blue wildrye *(Elymus glaucus)*, and brome *(B. laevipes)*, are important perennial native grasses under woodland shade. Herbaceous pine-oak woodland plants include red bells *(Fritillaria recurva)*, delphinium *(Delphinium menziesii)*, and cat's ear *(Calochortus tolmiei)*.

Madrone - Oregon White Oak - California Black Oak / Poison Oak Woodland

A dense woodland dominated by madrone *(Arbutus menziesii)* grows at the base of the andesite cliffs all around the Rocks. The rocky, well-drained loam soil below the cliffs also supports large black oak and some Douglas fir. The broad-leaved evergreen madrone with its smooth, cool bark can be a huge spreading tree or a dense multiple-stemmed chaparral. Madrone is well adapted to fire, resprouting vigorously after burning. Stump-sprouted clusters of multiple stems are evident in some stands, marking the position of burned "parent" trees. Growth ring counts of stump sprouts show elapsed time since the last fire. Large Douglas fir and pine occur near the talus slopes below the andesite cliffs where the rocky surface prevents the spread of fire.

Deer brush *(Ceanothus integerrimus)* with fragrant lavender-blue inflorescenses in May and June is an important understory shrub. Poison oak, ubiquitous in this community, may reach "old growth" proportions as a groundcover, shrub, or vine climbing 20 or more feet up tree boles. The low, creeping snowberry *(Symphoricarpus mollis)* forms dense patches. Hairy honeysuckle *(Lonicera hispidula)*, in the same family, is a common woody vine. White leaf manzanita is an understory plant. California fescue *(F. californica)* and blue wild rye, common native grasses in the understory, have tall culms. Notable herbs include *Smilacina stellata*, *F. recurva* and *Arnica latifolia*.

Mounded Prairie

Mounded prairie covers the summits of Table Rocks. This grass-dominated community displays a variety of plant associations along interactive gradients of soil depth and hydrology. These associations often grow in variable bands that conform to the contours of the mounds and intermounds. The resulting scene is a colorful array of species that blooms in successive rings toward the center of the intermounds as soil moisture recedes through the spring.

Introduced European grasses currently dominate the mound tops. Native bunchgrasses including Lemmon's needlegrass, pine bluegrass, California oatgrass, squirrel tail, and Idaho fescue are found only sparingly. In late summer, the native annual three awn *(Aristida oligantha)* becomes apparent. Dominant forbs change through the flowering season but usually progress through the following colorful series: Starting in April the bright yellow lomatium *(L. utriculatum)*, white popcorn flower *(Plagiobothrys nothofulvus)* blue miniature lupine *(Lupinus bicolor)*, pink cornsalad *(Plectritis congesta)*, lavender and white Collinsia *(Collinsia* ssp.*)*. Later, as the grasses cure, purple clarkia *(Clarkia purpurea)* and indigo brodiaea *(B. elegans)* dominate. Buckbrush and oak are abundant on some mounds, and in deeper soils.

The intermound areas are the most spatially varied in species composition, depending on soil depth and hydrology. Native species and a few aliens, adapted to the special habitat, dominate the intermound areas. Several plant association patterns tend to recur with considerable overlap on deep-soil intermounds. These associations include masses of white brodiaea *(B. hyacinthina)* with the delicate annual hairgrass, *(Deschampsia danthonioides)* and water foxtail *(Alopecurus geniculatus)*. In deeper, well-formed basins with longer-standing water, the association of coyote thistle *(Eryngium petiolatum)* and navarretia *(N. leucocephala)* and a popcorn flower *(Plagiobothrys bracteatus)* occurs. In late spring, Downingia *(D. yina)* forms a purple ring around these pools between the hairgrass and the coyote thistle. Goldfields *(Lasthenia californica)* characterize margins and other wet intermound areas, with less standing water but somewhat deeper soil. Goldfields often form a narrow band around deeper pools. Pauper's clover *(Trifolium depauperatum)*, the introduced Mediterranean barley *(Hordeum marinum)*, and wild onion *(Allium amplectens)* are also common.

Rhacomitrium — Sellaginella Rocky Scablands

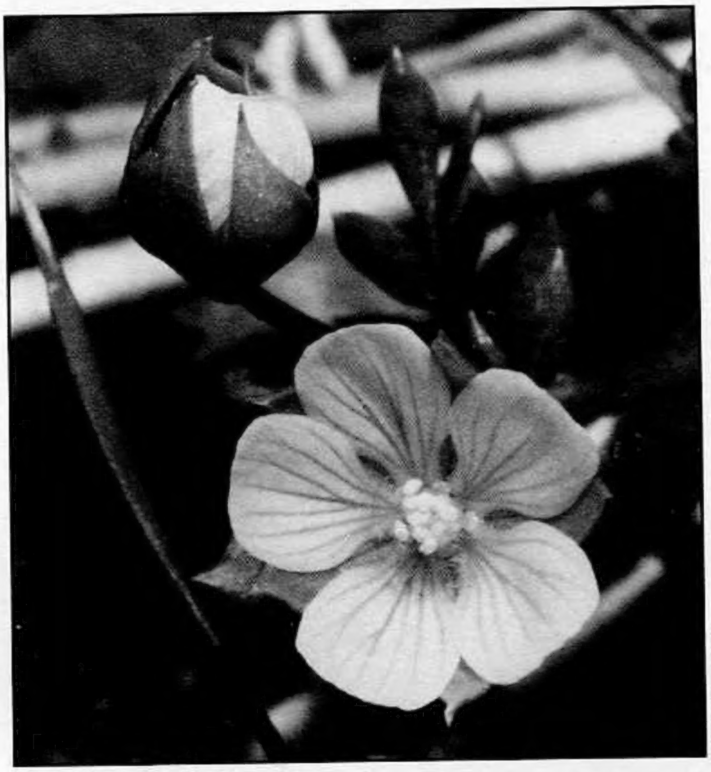
Bare andesite with a patina of soil accumulated deeper in crevices and strewn with andesite cobbles makes up the scablands of the mesa tops. A fragile community of mosses *(Rhacomitrium canescens)* and small vascular plants bind the soil to the bedrock. In the winter and spring, this community is full of botanical surprises. Tiny *Lomatium piperi* flowers in January. *Allium parvum* produces ephemeral sickle-shaped leaves in February and flowers in April. Where sufficient soil is present, tufts of native pine bluegrass *(Poa secunda* ssp. *secunda)* and magenta grass widows *(Sisyrinchium douglasii)* brave March storms. With summer, the community becomes dry and brittle in aestivation, waiting for a shower, or for fall rains so it can begin to grow again. The vascular cone-bearing spike-moss *(Sellaginella wallacii)* is an important component of this community. Other rock habitats, although not part of the mounded prairie, are also special areas for botanizing. The lace fern *(Cheilanthes gracillima)*, goldback fern *(Pentagramma triangularis)*, and licorice fern *(Polypodium glycyrrhiza)* are visible all year tucked in the fissures among columnar joints of andesite. In March, Brewer's rock cress *(Arabis breweri)* is also found here.

Unusual Plant Species

The flora of southwestern Oregon is extremely diverse with many localized endemic plants occurring in a relatively small geographic area. There are several such endemics on and around Table Rocks. There are other species not often seen elsewhere in southern Oregon.

Dwarf meadowfoam *(Limnanthes floccosa* ssp. *pumila)*, in the meadowfoam family (Limnanthaceae), is found only on top of Table Rocks. Dwarf meadowfoam's cream-colored, bowl-shaped flowers and pale-green herbage can be found along the margins of vernal pools and intermounds from late March to May. The leaves are deeply pinnately lobed, and the solitary flowers produce nutlets for fruits. The fruits seem to lack plant or animal dispersal mechanisms, contributing to the species' isolation on top of the two rocks. The U.S. Fish and Wildlife Service presently classifies dwarf meadowfoam as a category 1 candidate for listing under the Endangered Species Act.

Dwarf meadowfoam occurs mostly on margins of vernal pools (Hirsch and Riefler 1981). If inundation or saturation is sufficient, meadowfoam can grow in clay soil 1 to 20 cm deep, over andesite bedrock. Wet intermound areas support the largest proportion of the population. Meadowfoam density varies markedly from year to year. Fluctuations are greatest on the pool flanks where spatial and temporal inundation is most variable. Intermound populations are more stable. A five-year period (1986-1991) of monitoring the species shows a general increasing trend (The Nature Conservancy 1992).


TUTTLE — BLM

Dwarf meadowfoam

Southern Oregon buttercup (Ranunculus austro-oreganus) is endemic to central Jackson County. It occurs in oak savannas on the lower south flank of Upper Table Rock, but has not been found on Lower Table Rock. It differs from the more common western buttercup *(R. occidentalis)* by its fewer petals, the red veining on the backs of the petals, and the more densely villous pubescence on its leaves and stems. The U.S. Fish and Wildlife Service presently classifies southern Oregon buttercup as a category 2 candidate for listing under the Endangered Species Act.

Brewer's rock cress *(Arabis breweri)* in the Brassicaceae is a small purple rock cress growing on dry cliff faces of the Rocks. It occurs sporadically from Table Rocks in southern Oregon south to Mt. Diablo, California.

Oregon rock cress *(A. oregana)* has deep purplish-red petals and sepals and is found in oak woodlands on the slopes of Upper Table Rock. Its distribution is from southern Jackson County to northern California. This rock cress was a candidate for federal listing until 1980.

California sandwort *(Arenaria californica)* in the pink family (Caryophyllaceae) is a diminutive glabrous annual, occurring in the rocky scablands of the *Rhacomitrium canescens* community on top of the Rocks. Although very small, it grows close together in such large numbers that its flowers color the ground stark white. The California sandwort is found from here south to the Tehachapi Mountains, west of Bakersfield, California.

SEEVERS

California Sandwort

The unusual fern-ally, Nuttall's quillwort *(Isoetes nuttallii)* in the quillwort family (Isoetaceae), is an emergent wetland perennial. It looks like tufts of grass growing in the bottom of water-filled vernal pools. Its grass-like leaves attach to a corm submerged in the mud. Reproduction is by spores produced in sporangia in the enlarged leaf bases. Nuttall's quillwort is found in Washington, Oregon and California.

Henderson's fawn lily *(Erythronium hendersonii)* in the lily family (Liliaceae) is a southern Oregon endemic. It has bright lilac petals with a dark purple base. This fawn lily grows in profusion under oaks in early spring.

Red bells *(Fritillaria recurva)* in the lily family (Liliaceae), is found in southern Oregon and northern California. Its scarlet bell-shaped flowers stand out against early spring vegetation in Table Rock oak woodlands.

LANG

Redbells

Wildlife

In 1992 the Bureau of Land Management (BLM) established a "Watchable Wildlife Area" at Lower Table Rock to promote public opportunities for viewing. Whether on the slopes or on top of the Rocks, birds are most often seen. Turkey vultures and red-tailed hawks ride on updrafts near the Rocks and nest in trees or cliffs surrounding the rocks. Blue-gray gnatcatchers, more often heard than seen, nest at the northern edge of their range in buckbrush fields on the slopes. Water pipits are on top of the Rocks in winter. Violet-green swallows, tree swallows, Vaux's swifts, and white-throated swifts dart just off the edges of the rocks. Pileated woodpeckers can be heard drilling for insects in scattered large pines and Douglas fir below the cliffs. Acorn woodpeckers value dead and dying conifers, using them for granaries to store acorns. Oaks offer more than food by providing cavity nesting sites for birds and other animals. Tiny hummingbird nests can be found in the manzanita on top of the Rocks. The rustling of rufous-sided and brown towhees foraging in oak duff is never far off while hiking up the slopes. On the summit, lark sparrows court on the andesite cobbles of the intermounds. Lesser yellowlegs sometimes wade vernal pools in search of small aquatic arthropods.

Though seldom seen, resident mammals give away their presence by their signs, including tracks, scat, burrows and browsed plants. Abundant valley pocket gophers are detected by their mounded diggings in the grasslands. Dusky-footed woodrat nests, made of large piles of sticks, are obvious on the upper slopes along the trail. A small colony of California kangaroo rats on the Upper Rock occurs west of its principal range. The young shoots of buckbrush, an otherwise tough plant, are palatable to the black tail deer, which sculpt the shrubs into topiary forms.

The most common reptile is the western fence lizard, often seen along the trail and on top of both Table Rocks. The alligator lizard and the blue-tailed skink are also common residents, as are gopher snakes. The striped whipsnake, like the kangaroo rat, occurs here at the western edge of its range. Colorful red, black, and yellow California kingsnakes and western rattlesnakes are also notable residents of Table Rocks, although not often seen or heard.

Natural Area Management

The BLM and the Nature Conservancy manage a 3,317-acre natural area on Table Rocks. The Conservancy acquired its first tract on Lower Table Rock in 1978. Today the organization manages 1870 acres, including a 900-acre conservation easement. The Conservancy added nearly 200 acres to the preserve in the last three years in an ongoing effort to increase the protected status of lands within the designated preserve boundary. About 200 acres around the foot of Lower Table Rock remain to be protected. In 1984, the Medford District of the BLM amended its land-use plan to designate 1,240 acres of public land on both Upper and Lower Table Rocks as Areas of Critical Environmental Concern. ACECs are managed for the natural values of the site. Upper Table Rock is also designated as an Outstanding Natural Area to match Lower Table Rock's designation as a watchable wildlife site. The Rogue River Ranch is the other major landowner on the Rocks. The BLM and the Conservancy manage their lands cooperatively to maintain the biological diversity of this natural area. The agencies offer a nature experience for the public and environmental education for local school children. Public-use management minimizes impacts by confining use to trails, posting signs and by continuing educational programs. Posted guidelines at trailheads point out appropriate use.

Commodity use of Table Rocks is limited to livestock grazing under a BLM permit and the operation of a Federal Aviation Administration radio beacon on Upper Table Rock. Lower Table Rock has a grass airstrip, constructed in 1949. The BLM officially closed this runway, although planes still occasionally land. Currently, it serves as the hiking path to the south end of the Rock.

Ecological Management

Protecting natural features and restoration of natural, physical and biological processes are the main ecological management objectives. A restoration approach is taken where fundamental components of the system are missing or impaired. The role of fire and the invasion of non-native annual grasses and forbs are the most significant management concerns.

Preserves such as Table Rocks, designed to maintain or improve examples of the original grassland and savanna communities, offer valuable sites for research into restoration.

Increased use of prescribed burning under carefully-controlled conditions is essential to maintan these fire-dependent communities. A prescribed burning program is the best suppression practice for Table Rocks. Over the last 40 years, four significant fires on Lower Table Rock burned approximately 25 percent of the area.

Plant List

This list is not comprehensive. It covers commonly encountered species, as well as rare ones, from a variety of communities. Nomenclature follows Hickman (1993), or Hitchcock and Cronquist (1973).

Ferns & Allies

Cheilanthes gracillima (Lace fern); *Cystopteris fragilis* (Bladder fern); *Isoetes nuttallii* (Nuttall's quillwort); *Pentagramma triangularis* (Goldback fern); *Polypodium glycyrrhiza* (Licorice fern); *Selaginella wallacei* (Wallace's lesser club moss)

Grasses & Sedges

Achnatherum lemmonii (Lemmon's needlegrass); *Aira caryophyllea* (Silver European hairgrass); *Alopecurus saccatus* (Meadow foxtail); *Aristida oligantha* (Oldfield three-awn); *A. purpurea var. longiseta* (Red three-awn); *Avena fatua* (Wild Oat); *Briza minor* (Quaking grass); *Bromus diandrus* (Ripgut); *B. hordeaceaus* (Soft brome); *B. japonicus* (Japanese brome); *B. tectorum* (Cheat grass); *Cynosurus cristatus* (Crested dogtail); *Deschampsia danthonioides* (Annual hairgrass); *Eleocharis macrostachya* (Creeping spikerush); *Lolium perenne* (Perennial ryegrass); *Panicum capillare* (Witchgrass); *Poa bulbosa* (Bulbous bluegrass); *P. secunda ssp. secunda* (One-sided bluegrass); *Taeniatherum caput-medusae* (Medusahead wild rye)†; *Vulpia microstachys var. pauciflora* (Few-flowered fescue); *V. myuros var. hirsuta* (Foxtail fescue)†; *V. myuros var. myuros* (Rat-tail fescue)†

Forbs

Achillea millefolium (Yarrow); *Achyachaena mollis* (Blow-wives); *Agoseris heterophylla* (Annual agoseris); *Allium acuminatum* (Hooker's onion); *A. amplectens* (Slim-leaf onion); *A. parvum* (Little onion); *Amsinckia menziesii var. intermedia* (Rancher's fireweed); *A. menziesii var. menziesii* (Menzie's fiddleneck); *Aquilegia formosa* (Western columbine); *Arabis breweri* (Brewer's rock cress); *A. oregana* (Oregon rock cress); *Arenaria californica* (California sandwort); *Balsamorhiza deltoidea* (Deltoid balsamorhiza); *Berberis aquifolium* (Tall Oregon-grape); *Blepharipappus scaber* (Rough eyelash); *Brodiaea coronaria* (Elegant brodiaea); *B. elegans* (Harvest brodiaea); *Calochortus tolmiei* (Pussy ears); *Calystegia occidentalis ssp. occidentalis* (Variable morning-glory); *Camassia quamish ssp. quamish* (Camas); *Campanula prenanthoides* (California harebell); *Castilleja attenuata* (Valley tassels); *C. pruinosa* (Frosted paintbrush); *Centaurea solstitialis* (Yellow star thistle)†; *Chamomilla suaveolens* (Pineapple weed)†; *Chrysothamnus nauseosus* (Rubber rabbitbrush); *Clarkia gracilis* (Slender clarkia); *C. purpurea* (Purple godetia); *Claytonia perfoliata* (Miner's lettuce); *Collinsia grandiflora* (Large-flowered blue-eyed mary); *C. parviflora* (Small-flowered blue-eyed mary); *C. rattanii* (Rattan's blue-eyed mary); *C. linearis* (Linear-leaved blue-eyed mary); *Collomia grandiflora* (Chinese pagodas); *Crocidium multicaule* (Spring gold); *Cryptantha flaccida* (Weak-stemmed cryptantha); *C. intermedia* (Common cryptantha); *Cynoglossum grande* (Pacific hound's-tongue); *Delphinium andersonii* (Anderson's larkspur); *Dicentra formosa* (Bleeding heart); *Dichelostemma capitatum* (Blue dicks); *Dichelostemma congestum* (Ookow); *Dodecatheon hendersonii* (Henderson's shooting star); *Downingia yina* (Cascade downingia); *Draba verna* (Vernal whitlow-grass); *Epilobium torreyi* (Spike primrose); *Eriogonum compositum* (Northern buckwheat); *Eriophyllum lanatum* (Woolly sunflower); *Erodium cicutarium* (Stork's-bill)†; *Eryngium petiolatum* (Coyote-thistle); *Erythronium hendersonii* (Hendersons' fawn lily); *Eschscholzia californica* (California poppy); *Fritillaria affinis* (Checker lily); *F. recurva* (Scarlet fritellary); *Galium aparine* (Goose-grass); *Geranium molle* (Dovefoot geranium); *Gratiola ebracteata* (Bractless hedge-hyssop); *Hemizonia fitchii* (Fitch's tarweed); *H. pungens* (Common spikeweed); *Hesperochiron pumilus* (Dwarf hesperochiron); *Hypericum perforatum* (Klamath weed)†; *Idahoa scapigera* (Scalepod); *Lasthenia californica* (Goldfields); *Lemna gibba* (Duckweed); *Lepidium nitidum var. nitidum* (Shining peppergrass); *Limnanthes floccosa ssp. pumila* (Dwarf meadowfoam); *Linanthus bicolor* (Bicolored linanthus); *Lithophragma glabrum* (Prairie star); *L. parviflorum var. trifoliatum* (Three-leaved prairie star); *Lomatium piperi* (Piper's lomatium); *L. utriculatum* (Foothills lomatium); *Lonicera hispidula var. vacillans* (Hairy honeysuckle); *Lupinus bicolor* (Miniature lupine); *Madia gracilis* (Slender tarweed); *M. madioides* (Woodland tarweed); *Marah oreganus* (Coast man-root); *Micropus californicus* (Slender cottonweed); *Mimulus alsinoides* (Chickweed monkey-flower); *M. guttatus* (Seep-spring monkey-flower); *Minuartia californica* (California sandwort); *M. douglasii* (Douglas sandwort); *Monardella odoratissima ssp. odoratissima* (Western balm); *Montia linearis* (Narrow-leafed montia); *Myosotis discolor* (Yellow-and-blue forget-me-not)†; *Myosurus minimus* (Least mouse-tail); *Navarretia divaricata ssp. divaricata* (Mountain navarretia); *N. leucocephala* (White-flowered navarretia); *N. heterandra* (Tehama navarretia); *Nemophila pedunculata* (Meadow nemophila); *Oenothera deltoides* (Devil's lantern); *Orobanche uniflora* (Naked broom-rape); *Osmorhiza purpurea* (Purple sweet-cicely); *Pectocarya pusilla* (Little pectocarya); *Penstemon deustus* (Hot-rock penstemon); *P. laetus* (Gay penstemon); *Pentagramma triangularis* (Goldback fern); *Phacelia hastata* (Whiteleaf phacelia); *Phlox gracilis* (Pink annual phlox); *Plagiobothrys austinae* (Austin'a allocarya); *P. nothofulvus* (Rusty plagiobothrys); *Plectritis congesta* (Sea blush); *Potentilla biennis* (Biennial cinquefoil); *P. millefolia* (Cut-leaved cinquefoil); *Ranunculus austro-oreganus* (Southern Oregon buttercup); *R. lobbii* (Lobb's aquatic buttercup); *R. occidentalis* (Western buttercup); *Sanicula crassicaulis* (Pacific snakeroot); *S. graveolens* (Sierra snakeroot); *Saxifraga integrifolia* (Northwestern saxifrage); *S. nidifica* var. *nidifica* (Nesting saxifrage); *Scutellaria siphocampyloides* (Skullcap); *Senecio integerrimus* (Western groundsel); *Sisyrinchium bellum* (Blue-eyed-grass); *S. douglasii* (Grass widows); *Thysanocarpus curvipes* (Fringepod); *Trichostema lanceolatum* (Vinegar weed); *Trifolium depauperatum* (Poverty clover); *T. dubium* (Little hop clover)†; *T. variegatum* (White-tipped clover); *T. willdenovii* (Spring-bank clover); *Tritelia hyacinthina* (White brodiaea); *Viola douglasii* (Douglas violet); *V. sheltonii* (Shelton's violet); *Wyethia angustifolia* (Narrow-leaf mule's ear); *Yabea microcarpa* (Western hedge-parsley); *Zigadenus venenosus* (Death camas)

Shrubs

Amelanchier alnifolia var. *semiintegrifolia* (Western serviceberry); *Arctostaphylos viscida* (White-leaved manzanita); *Ceanothus cuneatus* (Buck brush); *C. integerrimus* (Deer brush); *Cercocarpus betuloides* (Birch-leaf mountain-mahogany); *Garrya fremontii* (Fremont's silk tassel); *Holodiscus discolor* (Ocean-spray); *Prunus subcordata* (Klamath plum); *P. virginiana* var. *demissa* (Western choke-cherry); *Rosa nutkana* var. *nutkana* (Nootka rose); *Rubus discolor* (Himalayan blackberry)†; *Sanguisorba minor* ssp. *muricata* (Garden burnet)†; *Toxicodendron diversilobum* (Poison oak); Vitis californica (California wild grape)

Trees

Arbutus menziesii (Pacific madrone); *Fraxinus latifolia* (Oregon ash); *Pinus ponderosa* (Ponderosa pine); *Populus balsamifera* ssp. *trichocarpa* (Black cottonwood); *Pseudotsuga menziesii* (Douglas-fir); *Quercus garryana* (Oregon white oak); *Q. kelloggii* (California black oak); *Salix scouleriana* (Scouler's willow)

(† denotes non-native species)

Plan a trip to Table Rocks. Spring is the best season for wildflowers. The peak season varies from year to year, depending on temperature and precipitation. Because of differences in blooming times (see Table 1) best flowers along the trail may be earlier than on the top. Make several trips. You are always welcome. Call the Medford District of the BLM (503-772-0022) for information.

Literature Cited

Agee, JK. 1990. The historical role of fire in Pacific Northwest forests. *In:* Walstead, JD, SR Radosevich and DV Sandberg (eds.). Natural and Prescribed Fire in Pacific Northwest Forests. Oregon State Univ., Corvallis.

Beckham, SD. 1971. Requiem for a people. *In:* The Rogue Indians and the Frontiersman. Univ. of Oklahoma.

Berg, AW. 1990 Formation of mima mounds: a seismic hypothesis. Geology 18:281-284.

Capps, G. 1992. A geologic field guide to the geology of the Table Rocks. Unpubl. document. Bureau of Land Management, Medford, Oregon.

Case, RM. 1983. Pocket gophers in prevention and control of wildlife damage. Cooperative Extension Service, Institute of Agriculture and Natural Resources, Univ. of Nebraska, Lincoln.

Cox, GW and VB Scheffer. 1991. Pocket gophers and mima terrain in North America. Natural Areas J. 11(4):193-198.

Davies, J. 1980. Douglas of the Forests: The North American Journals of David Douglas. Univ. of Washington Press, Seattle.

Detling, LE. 1961. The chaparral formation of southwestern Oregon, with considerations of its postglacial history. Ecology 42(92):348-357.

Franklin, JF and CT Dyrness. 1988. Natural vegetation of Oregon and Washington. USDA, GTR-PNW-8, Portland, Oregon. 417 pp.

Griffen, JR. 1988. Oak woodland. *In:* Barbour, MG and J Major (eds.). California Native Plant Soc. Spec. Publ. 9.

Habeck, JR. 1961. The original vegetation of the mid-Willamette Valley, Oregon. Northwest Science 35(2):65-77.

Heady, HF. 1977. Valley grassland. *In:* Barbour, MG and J Major (eds.). California Native Plant Soc. Spec. Publ. 9 491:514.

Hickman, JG (ed.). 1993. The Jepson Manual: Higher Plants of California. Univ. of Calif. Press, Berkeley.

Hirsch, L and J Reifler. 1981. A study of vernal pools on the summit of Upper Table Rock. Unpubl. rept., Southern Oregon State College Herbarium, Ashland.

Hitchcock, CL and A Cronquist. 1973. Flora of the Pacific Northwest. Univ. of Washington, Seattle.

Kagan, J. 1993. Comprehensive classification of plant community types in Oregon. Unpubl. document, Oregon Natural Heritage Program, Portland.

LaLande, J. 1983. First over the Siskiyous: Commentary of Ogden's routes of travel through northern California and southwestern Oregon, 1826-1827. Unpubl. ms.

Lane, J. 1884. History of Southern Oregon. AG Walling (ed.). Portland, Oregon, pp. 316, 334.

Leiberg, JB. 1900. Cascade range and Ashland forest reserves and adjacent regions. *In:* US Geological Survey 21st Annual Rept., 1899-1900, Part 5:211-498.

Orr, EL, WN Orr and EM Baldwin. 1992. Geology of Oregon, 4th ed. Kendall/Hunt Publ., Dubuque, Iowa.

Reigel, GM, BG Smith and JF Franklin. 1992. Foothill oak woodlands of the interior valleys of southwestern Oregon. Northwest Science 55(2):66-75.

Smith, WP. 1985. Plant association within the interior valleys of the Umpqua River Basin, Oregon. J. Range Management 38:526-530.

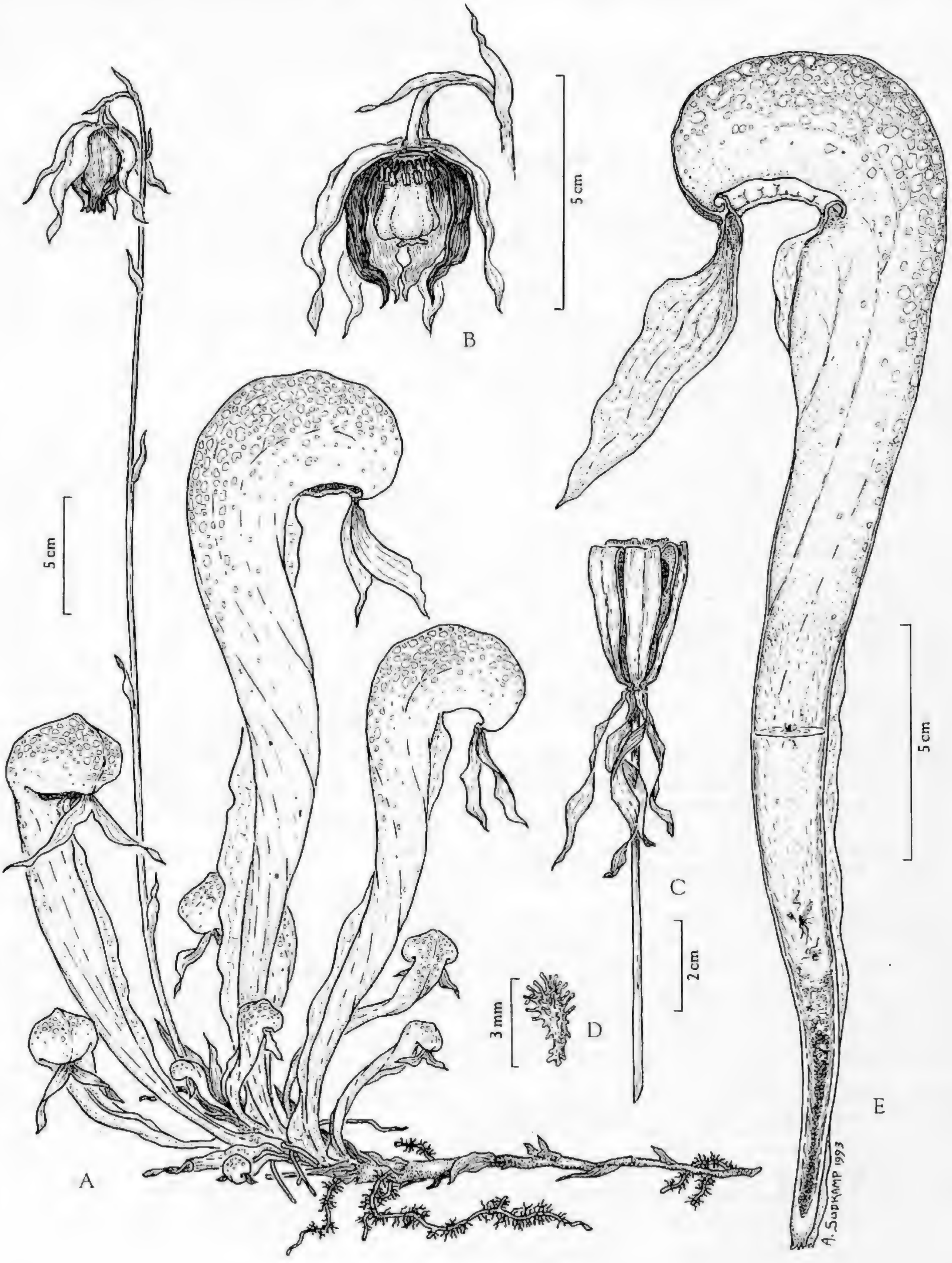
The Nature Conservancy. 1992. Monitoring plan for *Limnanthes floccosa* ssp. *pumila*. Unpubl. document, The Nature Conservancy, Portland, Oregon.

Thelenius, JF. 1968. The Quercus Garryana Forests of the Willamette Valley, Oregon. Ecology 49(6):1124-1133.

Wilkes, C. 1849. Narrative of the United States exploring expedition during the years 1838, 1840, 1841, 1842. V:215-250.

Table 1. Flowering time for common Table Rock plants

(Scientific Name) Common name	Jan.	Feb.	Mar.	Apr.	May	June
(Lomatium piperi) Piper's lomatium		✓				
(Sisyrinchium douglasii) Purple-eyed grass		✓	✓			
(Brodiaea hyacinthina) Hyacinth brodiaea			✓	✓	✓	
(Collinsia sp.) Blue-eyed Marys / Chinese pagodas			✓	✓		
(Crocidium multicaule) Spring gold			✓	✓		
(Draba verna) Draba			✓	✓		
(Lithophragma bulbifera, L. parviflora) Prairie stars			✓			
(Ranunculus occidentalis) Western buttercup			✓	✓		
(Saxifraga integrifolia, S. nidifica) Saxifrage			✓	✓		
(Sisyrinchium bellum) Blue-eyed grass			✓			
(Allium acuminatum, A. amplectens, A. parvum) Wild onion				✓	✓	✓
(Amsinckia intermedia) Fiddleneck				✓		
(Arenaria californica) Sandwort				✓		
(Balsamorhiza deltoidea) Balsamroot				✓		
(Calochortus tolmiei) Cat's (Kitten's) Ears				✓	✓	
(Cynoglossum grande) Hound's tongue				✓		
(Delphinium menziesii) Larkspur				✓		
(Dodecatheon hendersonii) Shooting star				✓		
(Downingia nana) Downingia				✓	✓	
(Erythronium hendersonii) Henderson's fawn lily / Lamb's tongue				✓		
(Fritillaria recurva) Red bells				✓		
(Hesperochiron pumilus) Strawberry flower				✓		
(Limnanthes floccossa ssp. pumila) Dwarf woolly meadowfoam				✓		
(Lomatium utriculatum) Desert parsley				✓		
(Lupinus bicolor, L. micrantha) Lupine				✓	✓	
(Mimulus guttatus, M. alsinoides) Monkey-flower				✓		
(Plectritis congesta) Rosy plectritis				✓		
(Ranunculus austro-oreganus) Southern Oregon buttercup				✓		
(Trifolium depauperatum) Pauper's clover / Cow's udder				✓		
(Viola douglasii) Douglas' violet				✓		
(Viola sheltonii) Shelton's violet				✓		
(Camassia quamash) Camas					✓	
(Castilleja pruinosa) Indian paint brush					✓	
(Clarkia purpurea, C. gracilis) Clarkia					✓	
(Psilocarphus brevissimus) Woollyheads					✓	
(Perideridia gairdneri) Yampa						✓
(Wyethia angustifolia) Mule's ears						✓



Darlingtonia californica: A) habit; B) cut-away view of flower; C) capsule; D) seed; and E) longitudinal section through a leaf, showing the interior of the pitcher

Darlingtonia

By FRANK LANG

This year's featured plant is one of our endemic plant marvels, the insectivorous *Darlingtonia californica*. The California pitcher plant, or hooded cobra lily is found in sphagnum bogs along the Oregon coast near Florence, inland to southwestern Oregon, and northern California to the Sierra Nevada and the Trinity Alps. In the interior, the plants are usually found along streams or in seepages on steep slopes in areas with serpentine soils.

The plants trap insects, attracted by sight and smell, in their upright tubular leaves. Small nectar glands cover the surface of the pitcher-like leaf, especially on the "mustache" that hangs down in front of the mouth and around the thickened "lips" of the opening. Once inside, flying insects are attracted to light entering the hood through transparent "windows" in the ceiling. After buzzing around inside, insects land on the smooth, waxy interior surface where they slide toward the pool of fluid at the slender base of the pitcher. On the way down, they pass over stiff downward pointing hairs that will prevent their upward escape. In the bottom of the tube they drown.

Insect carcasses break down by bacterial activity in the soup, and the plant absorbs the released nutrients. According to traditional wisdom, insectivory allows *Darlingtonia* to occupy low-nitrogen sites, such as these bogs and seepages, by obtaining nitrogen from insect proteins.

Attractive down-turned flowers with large yellow-green sepals and smaller maroon petals are produced in late spring, a single flower per stalk. After pollination, the flower turns upright as the fruit matures. Frequently, last year's upright capsules can be seen scattered among the new blossoms.

There is an hypothesis that the insects and pitcher plants have a mutualistic relationship; that is, both partners benefit. How? Not all insects may fall prey to the pitcher, and more might benefit from nectar than die in the soup. The pitcher plant profits from the supply of nitrogen.

To find pitcher plants, visit the Darlingtonia Wayside near Florence on the coast or go to the Illinois Valley. There are nice bogs along the Eight Dollar Mountain Road west of Highway 199 near Selma and where the old Oregon Mountain Road crosses Whiskey Creek southwest of O'Brien. Please leave these wonderful creations in the wild where they belong. Their growth requirements are difficult to duplicate, and cultivation almost always fails.

The botanical illustrator, Andy Sudcamp, Grants Pass, was a student of Dr. Linda Vorobik, principle illustrator for the Jepson Manual (see Book Review page 24). The text was originally broadcast as a Nature Note over the facilities of Jefferson Public Radio, Ashland, Oregon.

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Extinct and Extirpated Plants from Oregon

By JIMMY KAGAN and SUSAN VRILAKAS

Oregon is one of the most diverse states in the U.S., containing between six and ten nationally recognized ecoregions, depending on various ecoregion classifications. The state includes habitats which range from the moist and mild coast redwood forests of Curry County to the extremely dry playas of the Alvord Desert. Elevations range from coastal salt marshes at sea level, to alpine peaks over 9,000 feet. Each habitat provides unique opportunities for plant evolution.

Some areas, such as the Siskiyou Mountains of southwestern Oregon and the Wallowa Mountains of northeastern Oregon, have combinations of features which promote plant endemism. These include unique soils and varied elevations in old and geographically isolated landscapes. These factors have resulted in entire suites of unique local species.

Fortunately, significant parts of Oregon, including the Siskiyou and Wallowa Mountains, still resemble the presettlement conditions found when early settlers arrived at the end of the Oregon Trail. Unlike California, Hawaii and much of the eastern U.S., Oregon's biological diversity has better withstood the impact of the invasion of European culture. Other areas, such as the Willamette, Umpqua and Rogue River Valleys have very diverse floras and concentrated recent human development, resulting in vanishing habitats and species.

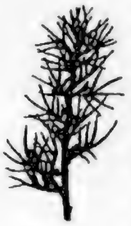
When the original Smithsonian publication, *Endangered and Threatened Plants of the United States* was printed in 1978 (Ayensu and DeFilipps, 1978), 182 plant species were included from Oregon, three of which were classified as extinct. In the following year, Siddall, et. al. (1979) published the booklet, *Rare, Threatened and Endangered Vascular Plants of Oregon*, which included 51 species thought to be either extinct or extirpated from Oregon. These potentially extinct or extirpated species were from habitats throughout Oregon, and a number had not been seen for over 50 years. Since that time, efforts of numerous botanists have resulted in the rediscovery of most of these species. Other species were found to be invalid by taxonomists and additional species have been added to the list. The remainder of this article is a discussion of the four taxa which are still thought to be potentially extinct, followed by descriptions of the 51 species listed by Siddall, et. al (1979).

Possibly Extinct Species as of 1 January 1993

Arenaria franklinii var. *thompsonii* (Thompson's sandwort) — This shrubby forb from sandy eastside habitats was first described by Peck in 1932, based on a 1928 specimen collected by J.W. Thompson, "near Arlington, dry sandy soil, sagebrush plains." An additional collection was made by Peck in 1933 on dry ground, Hermiston. This variety differs from var. *franklinii* in its smaller flowers (sepals less than 8 mm) and more open cyme.

Since then, many collections have been misidentified as this taxon, in Oregon and Washington. The most recent work, Washington Natural Heritage Program Status Report (Gamon 1986) determined that the taxon is probably extinct, and has never been collected in Washington. However, until it is rediscovered, there remains the possibility that it is not a distinct variety, but intergrades into var. *franklinii*.

Due to confusion and misidentification, it is recommended that the Thompson and Peck specimens at the Peck Herbarium at Oregon State University be carefully examined before attempting to relocate *Arenaria franklinii* var. *franklinii*.,



Astragalus kentrophyta var. *douglasii* (Douglas' milkvetch) — This is an unusual subspecies of a widespread taxon. *Astragalus kentrophyta* is a small, low-growing, almost shrubby forb which occurs in variable habitats, from high-elevation alpine slopes to low-elevation sandy plains. This subspecies is typical of Oregon's possibly extinct species in that very little is known of it. It was first collected in 1830 or 1833 by David Douglas when he traveled up the Columbia River on his way to the herbarium. All that exists of this collection at the Torrey herbarium is a fragment of an upper stem, with nothing more than "Oregon" on its label. A duplicate collection states "Columbia River." Barneby (1964) interprets the site as near or within the Great Bend of the Columbia River. It is assumed that this is the bend at the Oregon-Washington border, where the river turns from heading south to west. The type collection (at NY) was made by Brandegee and Tweedy from the Walla Walla region, Washington Territory in June 1883.

Although this was only collected twice, most taxonomists feel that it is a distinct and valid taxon, and not an anomaly. This taxon is distinguished from the other varieties of *A. kentrophyta* by its pod, which is ovate or lance-acuminate in profile and gently incurved into a definite beak as well as by its basifixed hairs (Barneby 1964).

Calochortus indecorus (Sexton Mt. Mariposa lily) This extinct species is known from only one fairly recent collection. Peck discovered the species and collected the type specimen in 1948 on Sexton Mountain, in northeastern Josephine County. It is an extremely showy, lavender-blue colored *Calochortus* which apears similar to *C. uniflorus*. The differing characteristics are that *C. indecorus* has more than one flower stem, lacks basal bulblets, is generally stouter and more erect, and has a much brighter flower color. Dr. Frank Lang of Southern Oregon State College and most other professional taxonomists believe that it is a distinct taxon and very narrow endemic which was probably recently destroyed. There is some reason to believe that Peck collected it near or on the site of the current location of Interstate 5. However, other local botanists believe that this may have been an aberrant patch of plants, perhaps a one-time hybridization (Callahan, pers. comm).

Dr. Lang, Southern Oregon State College botany classes, Frank Callahan, and other local botanists have spent countless unsuccessful hours attempting to relocate the species. Because these plants are apparently gone, the biology and origin of this species will probably remain a mystery.

Plagiobothrys lamprocarpus (shiny-fruited allocarya) — On June 2, 1921, C.V. Piper stopped at a wet spot on an old dirt road in Grants Pass and collected two species of *Plagiobothrys* which he did not recognize. Both of these were undescribed and apparently unknown to botanists. The larger had large white flowers and was named by Piper as *Allocarya corallicarpa*, for the coral-like sculpting on the mature seeds; the smaller was named *A. lamprocarpa*. The genus was revised in 1932 by I.M. Johnston, at which time they became *Plagiobothrys lamprocarpus* and *P. hirtus* ssp. *corallicarpus*. In 1989, Dr. Chambers renamed the latter *P. figuratus* ssp. *corallicarpus*, to more accurately reflect its taxonomic relationships.

In the 48 years between 1934 and 1991, the moist bottomlands around Medford and Grants Pass were extensively searched for both taxa, but neither species was relocated. Then in the summer of 1991, Richard Brock, a local botanist from Ashland, Oregon relocated *P. figuratus* ssp. *corallicarpus* in vernal pools near Pinehurst, in eastern Jackson County.

Plagiobothrys lamprocarpus has not been seen since the original collection. There are five specimens, located at Oregon State (OSC), Peck (WILLU) and Oregon (ORE) herbaria. The specimens are distinct from other *Plagiobothrys*, and it is apparently a species which has been lost.

In southwestern Oregon, *P. lamprocarpus* can be distinguished from other small (1-3 dm), slender, simple-stemmed, and erect *Plagiobothrys* species by its nutlets, which are usually only one or two (instead of the more typical four) and which have the ventral keel in a longitudinal grove.

Other species in Siddall, et. al's 1979 publication described as possibly extinct or extirpated from Oregon.

Agoseris elata — There are currently five reported locations in the northern and central Cascades of Oregon. However, there are now some taxonomic questions as to its distinctness from *A. grandiflora*.

Agrostis hendersonii — This taxon is currently recognized as A. *microphylla* var. *hendersonii*. It has not been seen in Oregon since Henderson's type collection from Gold Hill, Jackson County, 1930. There are recent reports of California collections, but it is considered endangered there.

Allium robinsonii — Last collected in Oregon near Boardman in 1940 by Peck, this species has been seen a number of times in Washington mainly along the Columbia River within the Hanford Nuclear Reservation. Disjunct populations have also been found in Ferry County in northeastern Washington. Until the Ferry County populations were discovered in 1975, it was believed that this species was limited to sand and gravel deposits along the Columbia River. These northern populations are from scabland habitats.

Amsinckia carinata — Known only from a single site, "...near Harper [OR] alt 1100 ft," *A. carinata* was collected in 1896 by Leiberg, and was believed to be extinct until rediscovered in 1985 by Elaine Joyal, the Vale District BLM botanist at the time. After deciding to make a concerted effort to rediscover this species, she travelled to the Gray Herbarium of Harvard University and located Leiberg's original journals She listed the other species Leiberg collected with *A. carinata*. As a result of these investigations, Joyal determined that Leiberg often mixed feet and meters in the elevation notes on the labels of his specimens. Therefore, she decided to search some of the volcanic knobs surrounding Harper instead of the valley bottomlands, and thus relocated the species.

Androsace elongata ssp. *acuta* — This subspecies continues to be known in Oregon only from an 1887 Thomas Howell collection from the Rogue River Valley, Oregon. It is more common in California.

Arabis serpentinicola — This species, like a number of other southwestern Oregon *Arabis* taxon, is a source of taxonomic confusion. Duane Goforth, in an unpublished manuscript, merged this taxon with *A. aculeolata* into *A. macdonaldiana*. Some local botanists believe that *A. serpentinicola* may still exist on Red Mountain in Curry County, Oregon. Others feel that it was never distinct enough to deserve species status. It will not be possible to evaluate its status until a revision of the taxonomy of this group of *Arabis* species is published.

Arabis suffrutescens var. *horizontalis* — Until this variety was rediscovered in 1984, it was thought to be extinct, having been last collected in 1950 in Oregon and 1951 in California. Wayne Rolle, Rogue River National Forest's botanist, relocated four populations on the rim of Crater Lake.

Arnica viscosa — The last known collection in Oregon was from Moraine lake, south of South Sister, Deschutes County in 1959. It was relocated in this area in 1980 and at about the same time another population was found near Sawtooth Mt. in Douglas County. It is currently known from three sites in the Oregon Cascades, but is more abundant in California.

Aster vialis — This species was not seen between 1933 and 1979, and during this interval was thought to be extinct. Georgia Mason first rediscovered the species at Mount Pisgah in Eugene and others have found additional populations in the Lane and northern Douglas County area. A total of 37 populations is now known.

Astragalus applegatei — This is a very unusual milk-vetch, which was only twice collected by Peck, both in the late 1930s. One site, the type location, was at Keno, the second was labeled "Klamath Falls." The habitat was described as a meadow, and the species had not been seen or collected since. James Kagan of the Oregon Natural Heritage Program rediscovered a population in southern Klamath Falls in 1983. There are still only two populations known in the world for this milk-vetch.

Astragalus peckii — Suspected to be extinct, this species was rediscovered in 1980 at Bull Flat, near Tumalo in Deschutes

County. It was found by Jack Kennison, then the summer botanist for the Deschutes National Forest. Ten major populations are now known for this species.

Astragalus robbinsii var. *alpiniformis* — Last collected in 1946 on Hurricane Creek in the Wallowa Mountains, this species was suspected to be extinct until its rediscovery in 1987 by James Kagan and Peter Zika, Oregon Natural Heritage Program. This taxon was not only relocated, it was found to be common in the major limestone drainages in the Eagle Cap Wilderness Area.

Calochortus longebarbatus var. *longebarbatus* — This species was considered possibly extirpated from Oregon, because it was not collected after 1961. Since 1979, it has been rediscovered on the Warm Springs Reservation in Wasco County, and on the Winema National Forest in Klamath County. There are now 27 recorded occurrences in Oregon. Over the last five years, this taxon has also been widely collected in Washington and California.

Castilleja levisecta — The last Oregon collection of this showy species was made in 1938 in Linn County. The state status for this species, extirpated from Oregon, has not changed since 1979, and it does not appear likely that it ever will. Through the years extensive searches have been made for the golden Indian paintbrush in the Willamette Valley and adjacent valley margin areas, without success. There is very little remaining upland grassland habitat which has not been farmed or developed in the Willamette Valley. Extant populations of *C. levisecta* can still be found in western Washington and British Columbia.

Cicuta bulbifera — This species has only been collected twice in Oregon, both by Klamath Lake. It was first found by Cusick in 1902, and last collected in 1950 by Peck on Upper Klamath Lake. No one has reported seeing this large wetland umbel in Oregon since.

Cypripedium calceolus var. *parviflorum* — Peck (1954) mentions that he saw a garden specimen, which was taken from the wild on Peavine Mt., Josephine County. There have been no more recent reports and no collections exist for this yellow lady slipper in Oregon.

Erigeron decumbens var. *decumbens* — Last collected in 1934, east of Springfield, this species was rediscovered in 1980 at Willow Creek by James Kagan and at William Finley National Wildlife Refuge by Bob Meinke, currently the program leader of the Plant Conservation Biology Program at the Oregon Department of Agriculture. Even though it has since been rediscovered at a number of other locations in the Willamette Valley, all populations are small, and the species is still threatened with extinction.

Erigeron decumbens var. *robustior* — Strother and Ferlatte (1988) concluded that all the southern Oregon collections originally considered to be *E. decumbens* var. *robustior* are a variety of *E. eatonii*. *Erigeron decumbens* var. *robustior* is restricted to northern California coastal habitats, and has never been collected in Oregon.

Erigeron engelmanii var. *davisii* — Until 1991, there was only one known location of *E. engelmanii* var. *davisii* in Oregon, a Wallowa County site not seen since 1979. Three new populations were located by Marty Stein in Hells Canyon in Oregon in 1991. At least 12 new sites were located on the Idaho portion of Hells Canyon during 1991 and 1992 Idaho Natural Heritage Program surveys.

Erigeron petrophilus — Before 1980, *E. petrophilus* was only known from a 1935 Thompson's collection, at Red Mountain, Jackson County. Since being recollected at Red Mountain in 1980, it has been reported from three other areas along the California border near the Jackson-Josephine County line.

Lobelia dortmanna — Known in Oregon from one old collection (N.P. Gale, no date) from the Metolius River, this circumboreal species was rediscovered in 1992 by Kathryn Cooper, a National Forest Service botanist. It was found along a shallow lakeshore on the Sisters Ranger District of the Deschutes National Forest.

Lomatium nelsonianum — This rare desert parsley was known only from three collections made in 1917, 1931 and 1945, from the Rogue River Canyon. In a letter from Dr. Lincoln Constance, University of California at Berkeley, to the Oregon Natural Heritage Program, he states his opinion that this species is not a valid taxon, but "a mixture of *Lomatium hallii* and *L. dissectum*."

Lomatium peckianum — This is one of the few species which have gone from being thought extirpated or extinct to too common to track. It had not been collected from 1927 until it was rediscovered by Virginia Crosby of the BLM in 1983. In 1992, it was dropped off the Oregon Natural Heritage Program Watch List, due to its abundance along the California, Oregon, Nevada border.

Lomatium salmoniflorum — This species remains possibly extirpated from Oregon. Peck collected it once in 1914, near The Dalles. Most of its range is in Washington and Idaho.

Lupinus cusickii var. *abortivus* — Both this variety and *L. cusickii* var. *brachypodus* have been submerged under the *L. lepidus-caespitosus* complex by Dr. Steve Broich, Oregon State University, in an as yet unpublished study for the Oregon Department of Agriculture. Both of these are no longer considered good taxa.

Lupinus cusickii var. *brachypodus* — see above.

Lupinus mucronulatus — This species is considered by David Dunn (Kartesz 1980) to be a synonym of *L. onustus*, a more common species from California.

Microseris douglasii var. *douglasii* — No new locality information has been reported on this California taxon since Thomas Howell's collection "on high hills opposite Ashland" in 1889.

Nama lobbii — Collected in 1899 by Leiberg on the slopes of Mt. Pitt (now called Mt. McLoughlin), this taxon was not collected for over 90 years. It turns out that this species is fairly common in the southern Oregon Cascades, and is no longer considered rare or endangered.

Nemacladus capillaris — Peck collected this species 26 miles east of Ashland on the Ashland-Klamath Falls Highway in 1920. Since then, there have been no other reported locations in Oregon.

Phacelia leonis — The only specimen from Oregon, Thomas Howell's 1884 collection from Waldo, Josephine County, is in fact not this species but *P. peckii* (K.L. Chambers, pers. comm.). California locations for *P. leonis* are just across the border from Oregon, but as yet there are no reported Oregon locations.

Phacelia malvaefolia — Another Thomas Howell collection made in 1884 at Chetco, Curry County is Oregon's only known sighting. It is primarily a California species.

Phacelia minutissima — There is only one collection from Oregon, made by Peck at Buckhorn Springs, Wallowa County in 1934, which has not been relocated in spite of two recent searches. It is known only from six recent reports from Idaho, Nevada and Washington.

Plagiobothrys hirtus var. *corallicarpus* — see *Plagiobothrys lamprocarpus* (above).

Plagiobothrys hirtus var. *hirtus* — This taxon is now called *P. hirtus* (Chambers 1989) and had not been seen since 1961 until rediscovered near Sutherlin in 1983 by James Kagan.

Plantago macrocarpa — Collected four times from the Oregon coast, three from the Yachats area and one from Yaquina Head, this species has not been seen since 1959. It can be distinguished from the other large, native, perennial *Plantago* taxa by its all basal leaves, glabrous corolla tube and large (6-8 mm) two-seeded fruits.

Pleuropogon oreganus — Only known from two areas, west of Adel in Lake County and near Union, Union county, *P. oregonus* was considered extinct because it had not been seen since 1936. In 1982, a population was found by James Kagan near Adel, most likely the same place where Peck made his 1936 collection. Cusick's 1886 collection from Hog Valley near Union was relocated in 1986 by Andrew Kratz after some historical sleuthing and talking with Union County old-timers who remembered the old local name for one of the creek valleys.

Ranunculus reconditus — This species was thought extinct until it was rediscovered in 1980 in the Columbia Hills of Washington by Keith Chamberlain. Dave Gross relocated *R. reconditus* five years later, on Mill Creek Ridge, southwest of The Dalles.

Sanicula tracyi — This species is known in Oregon only from a 1930 Kildale (9621, DS) collection in the vicinity of Waldo, Josephine County. In 1983, Tom Jimmerson, the ecologist for the Six Rivers National Forest (pers. comm.) reported to the Oregon Natural Heritage Program that Kildale's specimen was mislabeled, and that *S. tracyi* was never documented in Oregon. There has been no additional information on this species in Oregon.

Senecio porteri — This species has not been reported in Oregon since 1899 when it was collected by Cusick from "alpine ridges of the Wallowa Mts., near the lake." The species is currently known only from the Rocky Mountains in Colorado. Extensive searches in 1987, 1988 and 1991 for this distinct, one-flowered *Senecio* have yielded no recent collections.

Sidalcea malachroides — The last Oregon collection for this species was made near Pistol River, Curry County, in 1938. Very little is known about this *Sidalcea* which has dense racemes, with large (7-12mm long) rose or white colored flowers. Peck (1961) described it as occurring on "open slopes, southwestern Curry County."

Sidalcea malvaeflora ssp. *nana* — Not collected between 1952 and 1981, it is now thought too common in Jackson and Josephine Counties to be included on the Rare, Threatened and Endangered Species lists.

Sidalcea setosa ssp. *querceta* — This subspecies is known from the type location at Oak Flat, Curry County in 1953, based on three collections. It is now considered a synonym of *S. oregana* ssp. *spicata* (Dimling, pers. comm.).

Silene nuda ssp. *insectivora* — Although not seen between 1956 and 1982, there are now over 15 known populations from an area in southeastern Klamath County. The first of these was discovered by Virginia Crosby, then the BLM Lakeview District botanist.

Silene spaldingii — The last Oregon collection was made in 1898 by Cusick from the Wallowa Lake area of Wallowa County. It was rediscovered in this area in 1980 by Bonnie Heidel, but "lost" again until rediscovered in 1989 by James Kagan. There are now 12 known populations.

Synthyris missurica ssp. *hirsuta* — Last collected in 1881, and only known from the type collection, this was recently submerged under *S. stellata*, a Columbia gorge endemic, by C.G. Schaack (1983). He determined that the original specimen was misidentified and mislabeled.

Thelypodium howellii ssp. *spectabilis* — This taxon was collected six times in eastern Oregon before 1952. In 1969, Al-Shehbaz relocated J.T. Howell's 1952 collection site at North Powder, and found another population nearby, along Wolf Creek. In 1972 a dam was built on Wolf Creek, and the creek was modified into a series of irrigation ditches. *Thelypodium howellii* ssp. *spectabilis* was not seen again and believed to be extinct until it was rediscovered by Jimmy Kagan in 1980, along one of the drainage ditches which was all that remained of Wolf Creek. It is currently known from six very small populations in Baker Valley.

Since 1979, our knowledge of the distribution of Oregon's rarest plants has expanded greatly. The number of professional and amateur botanists has swelled, and has helped in the rediscovery of most of the plants thought to be extinct or extirpated in Oregon. We may never know what happened to the few plants still lost.

Literature Cited

Ayensu E.S. and R.A. DeFilipps. 1978. Endangered and Threatened Plants of the United States. Smithsonian Institution and World Wildlife Fund, Washington, D.C. 1978. 403 pp.

Barneby, R.L. 1964. Atlas of the North American Astragalus. Memoirs of the New York Botanical Garden, Vol. 13, Part I-II. The New York Botanical Garden, New York.

Chambers, K.L. 1989. Taxonomic relationships of *Allocarya corallicarpa* (Boraginaceae). Madrono 36(4): 280-282.

Gamon, J.G. 1986. Report on the status of *Arenaria franklinii* Dougl. ex Hook var. *thompsonii* Peck. Unpubl. rept., Washington Natural Heritage Program, Olympia. 24 pp.

Kartesz, J.T. and R. Kartesz. 1980. A Synonymized Checklist of the Vascular Flora of the United States, Canada and Greenland. University of North Carolina Press, Chapel Hill.

Peck, M.E. 1954. Notes on certain Oregon plants with description of new varieties. Leaflets of Western Botany 7(7): 177-200.

Peck, M.E. 1961. A Manual of the Higher Plants of Oregon. Binford and Mort, Portland, Oregon. 936 pp.

Schaack, C.G. 1983. A monographic revision of the genera *Synthyris* and *Besseya* (Scrophulariaceae). Ph.D. diss., Univ. Montana, Missoula.

Siddall, J.L., K.l. Chambers, and D.H. Wagner. 1979. Rare, threatened and endangered vascular plants in Oregon — an interim report. Oregon Natural Area Preserves Advisory Committee, Division of State Lands. 109 pp.

Strother, J.L. and W.J. Ferlatte. 1988. Review of *Erigeron eatonii* and allied taxa (Compositae: Astereae). Madrono 35(2): 77-91.

Recent Taxonomic Changes for Oregon Ferns and Fern Allies

By EDWARD R. ALVERSON

Readers of *Kalmiopsis* were recently treated to a synopsis of taxonomic changes affecting flowering plants in Oregon (Chambers, 1992). The present article has been written to update readers on nomenclatural changes recently proposed for the seedless vascular plants, which include not only ferns, but also horsetails, club-mosses, and their relatives. Together these groups are often referred to as the ferns and fern allies. Many new names have been incorporated in the new *Jepson Manual* for California (Hickman, 1993), as well as the treatment of ferns and fern allies in Volume II of *Flora of North America* (FNA), due out in September 1993. Publication of the FNA treatment of ferns and fern allies at this time is most fortunate, for there has been a great deal of new and exciting biosystematic research in this group in recent years. As a result, even some fairly modern taxonomic references, such as *Flora of the Pacific Northwest* (Hitchcock and Cronquist, 1973), are now substantially out-of-date with regard to the ferns and their allies. Table 1 (page 22) lists name changes for Hitchcock and Cronquist (1973).

Several features of the ferns and fern allies have traditionally caused difficulties for taxonomists. One feature is the relative lack of substantial differences in spore-producing structures (i.e. the sporangia and associated indusia) among closely related species. While sporangia may differ substantially among genera (even this is not always the case), differences among related species are usually minor, if any. Typically morphological differences in congeneric ferns must be sought in vegetative characteristics. Compare this with flowering plants, where often the flowers and fruits are the primary focus of evolutionary selection and thus are the primary sources of useful morphological distinctions. Second, there are high levels of parallelism, or convergent evolution, among the ferns and fern allies. Convergent evolution is where two unrelated evolutionary lines share a common morphological feature that has evolved independently. Morphological parallelisms have made it particularly difficult to classify ferns at higher taxonomic ranks, such as genera and families.

Despite these inherent difficulties with traditional taxonomic evidence, many of the new changes in fern taxonomy are the result of careful analysis of morphology, with a focus on characters that are phylogenetically informative, rather than confusing. At the same time, fern systematists have recently employed the modern research methods now utilized by flowering plant systematists. These include scanning electron microscopy (especially to study spore ornamentation), chromosome counts, isoenzyme studies, and DNA analysis. These techniques are typically used together to corroborate or refute hypotheses based upon morphological evidence. All of the name changes described below are founded upon real, visible macromorphological evidence, though in some cases the differences may seem rather cryptic. In most cases, changes in interpretation have been confirmed by the use of these other types of chemical or micromorphological data. This article is organized by taxonomic level, first discussing changes at the family level, followed by new generic names, and last, changes in species' names.

The Demise of the Common Fern Family, the Traditional Polypodiaceae

A big change for readers most familiar with *Flora of the Pacific Northwest* (Hitchcock and Cronquist, 1973) is the splitting of the common fern family, Polypodiaceae, into a number of smaller, evolutionarily discrete family units. This is not a new interpretation, and the system adopted by *The Jepson Manual* and *Flora of North America* is not substantially different from that first presented nearly 50 years ago by the Chinese pteridologist R.C. Ching (Ching, 1940). It has become clear to pteridologists that the Polypodiaceae *sensu lato* contained a number of distinct evolutionary lineages without evident common ancestry. Much activity in recent decades has focused on gathering sufficient data to find agreement on exactly which groups represent distinct families, a difficult challenge when it is realized that the greatest diversity of ferns is found in poorly-collected tropical and subtropical regions. To some extent the traditional Polypodiaceae was a construct of temperate zone botanists. With recent botanical exploration and collecting in the tropics providing much additional data on tropical groups, there is now sufficient agreement on the natural groups or lineages that can be recognized at the family level. Though it is possible there will be a few "adjustments" in the future, it is safe to say that there is now general agreement toward the recognition of smaller, more discrete families.

Under the classification presented in *The Jepson Manual* and *Flora of North America,* the Polypodiaceae comprises only the genus *Polypodium* and its close relatives, most of which are tropical in distribution. Other families include the Aspleniaceae (represented in our flora by the genus *Asplenium*); Blechnaceae (*Blechnum* and *Woodwardia*); Dennstaedtiaceae (*Pteridium*); Dryopteridaceae (*Athyrium, Cystopteris, Dryopteris, Gymnocarpium, Polystichum,* and *Woodsia*); Adiantaceae (called Pteridaceae in *The Jepson Manual,* with *Adiantum, Aspidotis, Cheilanthes, Cryptogramma, Pellaea,* and *Pentagramma*); and Thelypteridaceae (*Phegopteris* and *Thelypteris*).

The marsh ferns, *Thelypteris,* and wood ferns, *Dryopteris,* are good examples of unrelated lineages that in the past have been grouped because of similarities in frond outline and sorus characters. Both groups have reniform or kidney-shaped indusia. At one time they were combined into a single genus, but now they are placed in different families. *Thelypteris* species have two vascular bundles at the base of the petiole, hairs on the fronds, and base chromosome numbers of n=27 to 36. *Dryopteris* species consistently have three or more vascular bundles in the petiole, no hairs on the fronds, and a chromosome base number of n=41. These might not seem like major differences, but when compared with characteristics used to distinguish other fern groups, their magnitude and consistency suggest that the two lineages are not closely related.

New Names for Familiar Genera

Several of our familiar ferns and fern allies have been assigned new generic names. Most of these changes are a result of careful study of morphological and anatomical characters, and the data are strong enough that the splitting seems fairly well justified. One example is the familiar goldback fern, long known as *Pityrogramma triangularis* (Kaulf.) Maxon. The genus is primarily composed of a group of medium-sized tropical or subtropical species, such as *P. calomelanos* (L.) Link, characterized by a yellow or white farinose indument on the underside of the fronds. Members of the western North American *P. triangularis* complex possess the farinose indument, but are in many other ways anomalous in *Pityrogramma.* They are perhaps more closely allied to the group of genera related to *Cheilanthes* and *Pellaea* (Tryon and Tryon, 1982). In a review of the morphological, cytological, and chemical data, Yatskievych et al. (1990) concluded that differences between the *P. triangularis* group and the typical species of *Pityrogramma* were so numerous that the common features, such as the yellow or white farinose indument, were probably the result of convergent evolution. They described the new genus *Pentagramma* for the western species of the *P. triangularis* complex. Among the data supporting the separation of *Pentagramma* from *Pityrogramma* are the base chromosome number (x=30 vs. x=29), characters of frond morphology and vein patterns, rhizome scales, number of vascular bundles in the stipes, and spore ornamentation. A study of the chemical constituents of the waxy farinose indument demonstrated that none of the major compounds found in *Pentagramma* are present in the species of *Pityrogramma.* While a full biosystematic study of the genus *Pentagramma* has not yet been conducted, it appears that only one taxon, *P. triangularis* (Kaulf.) Yatskievych, Windham and Wollenweber ssp. *triangularis,* occurs in Oregon (Smith, 1980).

ALVERSON

Pentagramma triangularis

Clubmosses *(Lycopodium sensu lato)* are another group where recent workers have recognized segregate genera (Wagner and Beitel, 1992). Although the clubmosses share morphological similarities that immediately separate them from other groups of ferns and fern allies, Wagner and Beitel contend that groups of lycopod species (typically treated as subgenera) have more differences among them than do different, related groups of ferns long recognized as distinct genera. Differences that separate major groups of clubmosses, which include anatomy, chromosomes, spores, life cycles, and ecology, are sufficient to recognize discrete genera.

In addition to the type genus, *Lycopodium*, the genera Diaphasiastrum, Lycopodiella, and Huperzia are also found in Oregon. *Lycopodium* now contains only the "typical" clubmosses, represented in Oregon by *L. clavatum* L., *L. annotinum* L., and *L. dendroideum* Michx. Hickey (1977) determined that *L. dendroideum* was the proper name for our taxon previously identified as *L. obscurum* L., which is restricted to eastern North America. The genus *Diaphasiastrum* is the group of species known as ground-cedar, represented in Oregon by *D. complanatum* (L.) Holub and *D. sitchense* (Rupr.) Holub. The bog clubmoss, which occurs in Oregon primarily along the coast, will now be called *Lycopodiella inundata* (L.) Holub. While some will probably consider this a case of excessive splitting, I would urge botanical generalists to base their conclusions on the merits of the case rather than the difficulty of pronouncing new names.

Huperzia miyoshiana

The last group of Oregon lycopods to consider are the fir clubmosses of the *Lycopodium selago* group, now placed in the genus *Huperzia*. These speciea are distinctive in that they produce gemmae in the upper leaf axils that disperse and grow into new plants. Hitchcock and Cronquist (1973) grouped all northwest plants into the single species *L. selago*. More recent research has shown that there are several other distinct species present in the Pacific Northwest, so the most up-to-date taxonomy of this group involves new generic and new species names. This group is represented in Oregon by *Huperzia occidentalis* (Clute) Beitel. It is found in northwestern Oregon in moist to boggy forests, where it often grows on rotting logs (Beitel 1986; Beitel and Mickel 1992). *Huperzia occidentalis* is distinguished from the other members of the *H. selago* complex by its broad, oblanceolate leaves that are spreading to reflexed, with papillate margins, and stems with marked annual constrictions (Beitel 1986). Other members of this complex, especially *H. miyoshiana* (Makino) Ching, may occur in northern Oregon. This species usually grows on rock outcrops or talus, has narrow, linear leaves that are spreading to ascending, is yellow-green in color, and has distinctive juvenile stems with recurved tips. These two species often produce sterile hybrids when they grow in proximity.

The Mysteries of Reticulate Evolution

Many recently described species are members of allopolyploid species complexes (allo = different; polyploid = multiple sets of chromosomes). This type of evolution is common in ferns, and is initiated when two related but distinct species hybridize. Usually (though not always) the parents involved in formation of the hybrid are basic diploid species, with the standard two sets of chromosomes per cell. The initial hybrids are also diploid, and though they can grow into mature plants, they are unable to reproduce, because the spores they make are not viable because of genetic differences between the equivalent chromosomes that originated from each of the two parental species. These differences in chromosome structure prevent the chromosomes from pairing and separating normally during meiosis (the type of cell division that occurs in the formation of spores.) An occasional abnormal cell division may occur in these sterile hybrids that results in doubling the chromosome set in a single reproductive cell. With double the complement of chromosomes, meiosis in the next generation of plants proceeds normally, because the duplicated chromosomes (which originated from the same parent) can pair with one another. When these fertile plants with double the chromosomes are able to reproduce sufficiently to sustain established populations, a new species is generated.

Fern taxa generated by this process are considered distinct species because they are reproductively fertile, morphologically differentiated, and reproductively isolated from the two original diploid parent species. Such species, when they have four sets of chromosomes per cell, are called allotetraploids. There can be allopolyploids with six sets of chromosomes (allohexaploid) or eight sets (allooctaploid) or more, although I am not aware of allopolyploid ferns in Oregon with more than four sets of chromosomes.

This type of speciation is referred to as reticulate evolution, because it represents the recombination of formerly divergent evolutionary lines into a third lineage that is a combination of the two parents. Given sufficient time, species that arise via reticulate evolution may spread to cover extensive geographic areas. In some cases, an allopolyploid may have a much wider geographic distribution than one or both of its diploid parent species. The reason for the success of established allopolyploids has been a subject of much discussion, but may be related to the ability of an allopolyploid to tolerate a wider range of conditions than either parent (Wagner and Wagner, 1980). Genetic characteristics of allopolyploids are generally expressed in an additive fashion, combining the features of both parents. Morphologically, this tends to be expressed as an intermediate condition. If one parent has fronds that are once-pinnate, and the other parent has fronds that are tripinnate, the allopolyploid will generally have fronds that are bipinnate. Where there are ecological differences between the two parents, allopolyploids may have the ability to occupy the habitats of both parent species as well as habitats that are intermediate between those of the parents. Thus an allopolyploid may be ecologically more versatile than either of its parents. While reticulate evolution may represent a sort of evolutionary cul-de-sac, allopolyploids can be very successful species, and even help to perpetuate genetic diversity by propagating a particular genetic line after one diploid parent has become extinct.

Some Examples of Reticulate Evolution in the Pacific Northwest

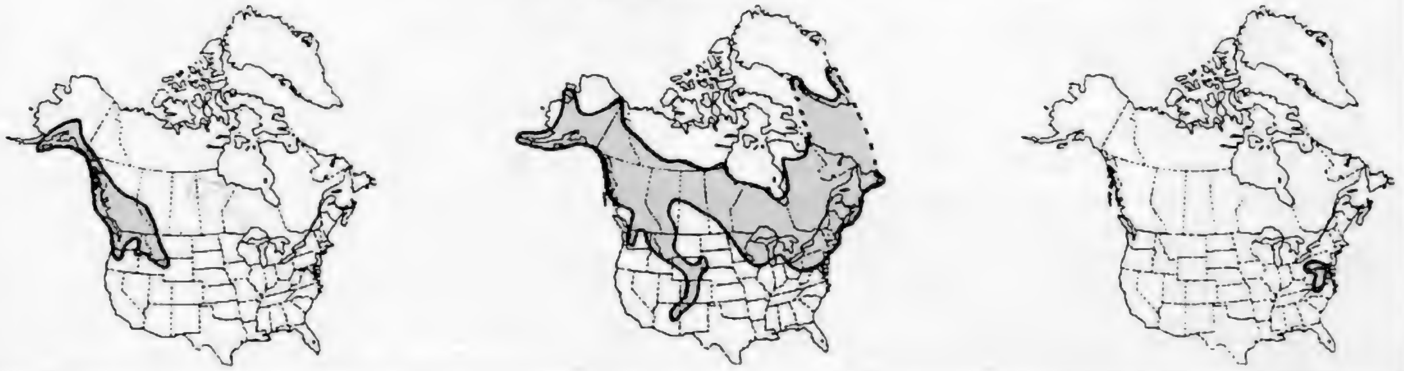
Like a surprise ending to a good detective novel, there is something satisfying about the discovery of a case of reticulate evolution where it has not been suspected. One case that has recently been brought to light is that of the northern maidenhair fern, *Adiantum pedatum* L. These maidenhair ferns are now understood to comprise an allopolyploid complex of two diploid species and one allotetraploid species (Paris and Windham, 1988). The currently accepted name for the representative present in Oregon and elsewhere in western North America is *A. aleuticum* (Rupr.) Paris (Paris, 1991). *Adiantum pedatum* proper is restricted to eastern North America. Both of these are basic diploid species, and though morphologically similar, they are distinguished by subtle characteristics of frond morphology. For example, the ultimate frond segments (pinnules) in *A. aleuticum* tend to be more elongate, with deeper and wider incisions on the upper (acroscopic) margin, compared to *A. pedatum*. Paris found that *A. aleuticum* also occurs in a few places in eastern North America within the general range of *A. pedatum*. In Vermont, populations of an allotetraploid originated from hybridization between *A. pedatum* and *A. aleuticum*, followed by chromosome doubling. This allotetraploid, named *A. viridimontanum* Paris, also provides corroborating evidence that *A. pedatum* and *A. aleuticum* are specifically distinct (Paris, 1991).

ALVERSON

Adiantum aleuticum

The oak ferns, *Gymnocarpium*, provide another example of reticulate evolution that was only recently deciphered. In this case, the well-known name, *Gymnocarpium dryopteris* (L.) Newm., applies to an allotetraploid species that is widespread across northern North America. The two diploid parents of *G. dryopteris* are found in the Pacific Northwest and the eastern U.S., respectively. *Gymnocarpium disjunctum* (Rupr.) Ching is the name of the northwest diploid, and the recently discovered eastern diploid has been named *G. appalachianum* Pryer and Haufler (Pryer and Haufler, 1993). The two diploid species are distinguished by subtle, but constant features of frond morphology. For example, in *G. appalachianum*, the second pair of pinnae is usually stalked, while in G. *disjunctum* it is always sessile. Unfortunately, the morphologically intermediate G. *dryopteris* tends to confuse the issue. With herbarium specimens, G. *dryopteris* can easily be distinguished from both diploid species by its significantly larger spores. In the field, identification can be more difficult, especially in regions such as the Pacific Northwest where G. *dryopteris* is sympatric with one of the diploids. In G. *disjunctum*, the first pairs of pinnules of the second and third pinnae are unequal in length; the lower, or basioscopic pinnules are longer. In G. *dryopteris* the first pairs of pinnules of the second and third pinnae are more or less equal in length. While G. *disjunctum* is by far the more common species in Oregon, there are apparently a few records of G. *dryopteris* in Oregon as well.

North American distribution of *Gymnocarpium disjunctum* (diploid), *G. dryopteris* (tetraploid), *G. appalachianum* (diploid).



Patterns of reticulate evolution in *Adiantum* and *Gymnocarpium* are similar in many ways; there are also some significant differences. In *Adiantum*, the allotetraploid species is of limited distribution, and occurs only within the geographic area where the ranges of two diploid species overlap. In contrast, the allotetraploid in *Gymnocarpium* is very widely distributed, occurring in Europe as well as across North America. The two diploid species have relatively narrow geographic distributions that at present do not overlap. This evidence suggests that G. *dryopteris* originated at some time in the distant past, while A. *viridimontanum* is a relatively young species. It probably originated after the last ice sheet receded from northern North America, and has not had sufficient time to establish a wider geographic presence.

Several cases of reticulate evolution have been found in western North American species of polypody or licorice fern, *Polypodium*. This genus is a hotbed for reticulate evolution, and the *P. vulgare* L. complex in Europe was one of the first examples of reticulate evolution in ferns to be documented and described (Manton 1947). In the Pacific Northwest, Frank Lang demonstrated that the widespread western species *P. hesperium* Maxon was in fact an allotetraploid that originated via hybridization between the common licorice fern, *P. glycyrrhiza* D.C. Eaton, and a second diploid species, now known as *P. amorphum* Suksdorf, that occurs at higher elevations in the Cascades and coast ranges (Lang 1971). *Polypodium glycyrrhiza* is the common low-elevation species west of the Cascades, and grows on tree trunks, rocks, or soil banks. When growing on rocks, it is usually rooted in mats of moss on the tops of boulders or ledges, but not in crevices. *Polypodium amorphum* is found in rock crevices mostly at higher elevations from the Cascades westward. *Polypodium hesperium* also grows either on rock surfaces or in crevices, and is the only species present east of the Cascades. Only in a few places, such as in the Columbia River Gorge, do all three species grow in proximity, but even in these cases there are useful morphological and phenological differences that help distinguish the species (Lang 1971).

Another allopolyploid complex in the genus *Polypodium* relevant to the Oregon flora involves *P. glycyrrhiza* and a California species, *P. californicum* Kaulf. These two diploid species have hybridized to form an allotetraploid species recently named *P. calirhiza* Whitmore and Smith, which extends northward from California to the southern and central Oregon coast (Whitmore and Smith 1991). Although morphologically variable, *P. calirhiza* is distinguished from *P. glycyrrhiza* by an irregular vein pattern and the presence of anastomosing (netted) veins, by the more ovate rather than lanceolate frondoutine, pinna tips that are acute to obtuse vs. attenuate to acute, and by oval rather than round sori. Triploid "backcross" hybrids between *P. calirhiza* and *P. glycyrrhiza*, which can be recognized by their abortive spores, are fairly common, and can provide the impression of a continuous range of morphological variation between the two species.

In some cases, allopolyploid complexes cannot be understood by research limited to a single geographic region. For example, the common wood fern *(dryopteris)* species in the Pacific Northwest was called *Dryopteris austriaca* (Jacq.) Woynar by Hitchcock and Cronquist (1972). *Dryopteris austriaca* is a name properly applied to a tetraploid species found in Europe (also known as *D. dilatata* [Hoffm.] Gray), but the plants in the Pacific Northwest are diploid. Our plants are a distinct diploid species (Walker 1961; Britton 1972), widely distributed in North America and Europe, which has hybridized with another diploid species to form the allotetraploid species *D. austriaca*. In an interesting twist, Wagner found that the diploid species was first described as *Nephrodium expansum* in the 1840s by Presi, based upon a specimen collected on Vancouver Island in the 1790s. So even though our diploid species was only recently recognized as a distinct taxon based upon modern techniques, it was first collected and described over 150 years ago! Our common wood fern of moist forests is now known as *D. expansa* (Presi) Frasier-Jenkins and Jermy (Frasier-Jenkins and Jermy 1977).

Western North American representatives of the sword or holly fern genus, *Polystichum*, have been a subject of intensive study for over 30 years. Many of our species, including *P. californicum*, *P. kruckebergii*, and *P. scopulinum*, are known to be allotetraploid species representing various combinations of diploid species present in the region (W. Wagner 1973). David Wagner (1979) concluded that the sword fern of dry, rocky habitats, *P. imbricans* (D. Eaton) D. Wagner, is a distinct species from the common sword fern *P. munitum*, and not a variety. Because *P. munitum* has been implicated as one of the diploid parents in several allopolyploid species, this brought up the question of whether *P. munitum* or *P. imbricans* was involved. Contrary to what might have been expected, isoenzyme and DNA investigations have indicated that it was *P. imbricans*, and not the more common *P. munitum*, that was one of the two diploid parents of both *P. californicum* and *P. scopulinum* (Soltis et al. 1991).

Another taxonomic conclusion that came out of Wagner's research was that our serpentine endemic is not *P. mohrioides* (Bory) Presl, a species that occurs in the southern hemisphere, but is a separate species that should be called *P. lemmonii* Underw. (D. Wagner 1979).

Newly Described Oregon Fern Species

In my graduate research, I studied the parsley-fern genus, *Cryptogramma*. I concluded that our common North American species is properly called *C. acrostichoides* R. Br., and it is clearly distinct from the European parsley fern, *C. crispa*. In addition, I described a second diploid species from western North America, *C. cascadensis* Alverson (Alverson 1989). This new species is found in the Cascade, Sierra Nevada, and northern Rocky Mountains, where it tends to occur at higher elevations or in more mesic habitats than *C. acrostichoides*. *Cryptogramma cascadensis* is distinguished by a set of subtle morphological characters. For example, the pinnules tend to be cuneate rather than ovate, the fronds are deciduous in the fall rather than green through the winter, and the frond color is a lighter shade of green. Isoenzyme analysis provided evidence of substantial genetic differences between the two species.

ALVERSON

Cryptogramma cascadensis

The moonworts of *Botrychium* subgenus *Botrychium* are among the rarest and most fascinating ferns. These plants are seldom collected and are poorly represented in herbaria. In addition, they often occur in mixed populations, so it is not uncommon for specimens on a single herbarium sheet to represent more than one taxon (Wagner and Wagner 1983). As a result, past taxonomic treatments have been rather superficial, and have not recognized a number of interesting and distinctive morphological types. Over the past several decades, this group has been the subject of intensive field and lab research, particularly by W.H. (Herb) Wagner, his wife Florence, and their students and colleagues. This research has resulted in the description of many new species, some of which were first discovered in Oregon. Among these are *B. crenulatum* Wagner, related to the widespread species *B. lunaria* (L.) Swartz, but a more delicate plant with fewer pairs of pinnae (Wagner and Wagner 1981). *Botrychium montanum* Wagner is a small, inconspicuous species in cedar swamps and other shady forests (Wagner and Wagner 1981), and probably survives in such shaded habitats through a beneficial relationship with a mycorrhizal fungus. *Botrychium ascendens* Wagner, also related to *B. lunaria*, has narrower pinnae that are angled upward (Wagner and Wagner 1986). *Botrychium pedunculosum* Wagner is related to *B. pinnatum* St. John (see below) but has a pedunculate sterile segment and a gray-green color (Wagner and Wagner 1986). The type localities for the latter two species are from the Wallowa Mountains in northeastern Oregon.

In addition to describing new species, the Wagners have reinterpreted the names of some other fairly well-known taxa. For example, they believe that *B. boreale* Milde occurs only in Europe, and *B. pinnatum* is the appropriate name for the related species in western North America. *Botrychium lunaria* var. *onondagense* (Underw.) House properly refers only to a shade form of *B. lunaria*. Most plants that key to this in *Flora of the Pacific Northwest* are actually *B. minganense* Victorin, another species in the *B. lunaria* group (Wagner and Lord 1956). While much new information has been obtained on Oregon botrychiums, it is clear that a great deal of work remains to be done.

A group related to *Botrychium* is the adders-tongue genus, *Ophioglossum*. Our species has in the past been called *O. vulgatum*, a species found in Europe but not North America. Based upon a number of morphological features including leaf shape, color, texture, and spore size, Wagner has concluded that the plants found in the Pacific Northwest belong to a species called the northern adders-tongue, *O. pusillum* Raf.

Botrychium paradoxum

(Wagner 1971). This taxon is found across the northern portions of North America. Another segregate of *O. vulgatum* is found in the eastern and southeastern U.S.

Of all the name changes recently proposed for Oregon ferns and fern allies, only a few of the new names are mandated by the regulatory framework of plant taxonomy. Following the latest taxonomic advice available at the time, Hitchcock and Cronquist (1973) used the name *Athyrium distentifolium* for the mountain lady fern, rather than the traditional name, *A. alpestre*. Lellinger (1981) has concluded that *A. alpestre* is the oldest applicable name after all, and that our plants are properly called *A. alpestre* (Hoppe) de Claireville ssp. *americanum* (Butters) Lellinger. The green spleenwort, formerly known as *Asplenium viride* Huds., is properly referred to by an older name, *A. trichomanes-ramosum* L. Earlier authorities rejected the latter name because of confusion with *A. trichomanes* L., which is a different species also found in Oregon. Lellinger (1981) pointed out that the hyphenated form is not a valid basis for rejecting a name, as there are examples of other well-known ferns that have hyphenated specific epithets. *Asplenium trichomanes-ramosum* is one of the rarest ferns in Oregon, known only from a single colony at timberline in the Wallowa Mountains (Zika 1988).

Why is it important to learn these new names? Names are crucial to our ability to learn, describe, and communicate knowledge and experiences, and thus improve our ability to observe, distinguish, and comprehend. Are all these changes really justified? To those who are not regular readers of the scientific literature, the number of changes described in this article may seem excessive. It is only natural to be skeptical when new, unpronounceable epithets replace familiar and time-honored names. I would hope that nomenclatural changes based on new information regarding evolutionary relationships would be supported by evidence that makes a compelling case for change. It would be overly cavalier to do otherwise. If supporting evidence is sufficiently strong, there is no place for taxonomic sentimentality. Science and natural history are all about discovery, and those who prefer tradition over progress may be missing the most interesting part of the program.

Table 1. "New" names for northwest pteridophytes due to revised generic or species concepts and/or clarification of species concepts where the old name refers to a taxon not found in Oregon. In some cases these are actually newly-described species names, but others are names that had been described earlier but were not recognized by Hitchcock and Cronquist.

Name in Hitchcock & Cronquist	New Name	Page in Hitchcock & Cronquist
Adiantum pedatum	*Adiantum aleuticum*	48
Asplenium viride	*Asplenium trichomanes-ramosum*	48
Athyrium distentifolium var. *americanum*	*Athyrium alpestre* ssp. *americanum*	49
Botrychium boreale	*Botrychium pinnatum*	45
Botrychium lunaria var. *onondagense*	*Botrychium minganense*	45
Cryptogramma crispa var. *acrostichoides*	*Cryptogramma acrostichoides*	50
Dryopteris austriaca	*Dryopteris expansa*	51
Lycopodium complanatum	*Diaphasiastrum complanatum*	40
Lycopodium sitchense	*Diphasiastrum sitchense*	40
Lycopodium obscurum	*Lycopodiella inundata*	50
Lycopodium obscurum	*Lycopodium dendroideum*	50
Lycopodium selago	*Huperzia miyoshiana*	50
Lycopodium selago	*Huperzia occidentalis*	50
Ophioglossum vulgatum	*Ophioglossum pusillum*	45
Pityrogramma triangularis	*Pentagramma triangularis*	52
Polystichum mohrioides	*Polystichum lemmonii*	54
Polystichum munitum var. *imbricans*	*Polystichum imbricans*	53
Thelypteris phegopteris	*Phegopteris connectilis*	54

References

Alverson, E.R. 1989. *Cryptogramma cascadensis*, a new parlsey fern from western North America. Amer. Fern J. 79:95-104.

Beitel, J.M. 1986. The *Huperzia selago* (Lycopodiaceae) complex in the Pacific Northwest. Amer. J. Bot. 73:733-734.

Beitel, J.M. and J.T. Mickel. 1992. The Appalachian firmoss, a new species in the *Huperzia selago* complex in eastern North America, with a new combination for the western firmoss. Amer. Fern J. 82:41-46.

Britton, D.M. 1972. Spinulose wood ferns *Dryopteris*, in western North America. Can. Field Nat. 86:241-247.

Chambers, K.L. 1992. Some recent taxonomic changes affecting the names of Oregon plant species. Kalmiopsis 2:16-20.

Ching, R.C. 1940. On natural classification of the family Polypodiaceae. Sunyatsenia 5:201-268.

Frasier-Jenkins, C. and C. Jermy. 1977. Nomenclatural notes on Dryopteris: 2. Fern Gazette 11:45-48.

Hickey, R.J. 1977. The *Lycopodium obscurum* complex in North America. Amer. Fern J. 67:45-48.

Hickman, J.C., ed. 1993. The Jepson Manual, Higher Plants of California. University of California Press, Berkeley.

Hitchcock, C.L. and A. Cronquist. 1973. Flora of the Pacific Northwest. University of Washington Press, Seattle.

Lang, F.A. 1971. The *Polypodium vulgare* complex in the Pacific Northwest. Madrono 21:235-254.

Lellinger, D.B. 1981. Notes on North American Ferns. Amer. Fern J. 71:90-94.

Manton, I. 1947. Polyploidy in *Polypodium vulgare*. Nature 159:136.

Paris, C.M. 1991. *Adiantum viridimontanum*, a new maidenhair fern in eastern North America. Rhodora 93:105-121.

Paris, C.M. and M.D. Windham. 1988. A biosystematic investigation of the *Adiantum pedatum* complex in eastern North America. Syst. Bot. 13:240-255.

Pryer, K.M. and C.H. Haufler. 1993. Electrophoretic and chromosomal evidence for the allotetraploid origin of the common oak fern *Gymnocarpium dryopteris*. Syst. Bot. 18:150-172.

Smith, D.M. 1980. Flavonoid analysis of the *Pityrogramma triangularis* complex. Bull. Torrey Bot. Club 107:134-145.

Soltis, P.S., D.E. Soltis, and P.G. Wolf. 1991. Allozymic and chloroplast DNA analyses of polyploidy in *Polystichum* (Dryopteridaceae). 1. The origins of *P. californicum* and *P. scopulinum*. Syst. Bot. 16:245-256.

Tryon, R.M. and A.F. Tryon. 1982. Ferns and Allied Plants, with Special Reference to Tropical America. Springer-Verlag, New York.

Wagner, D.H. 1979. Systematics of *Polystichum* in western North America. Pteridology 1:1-64.

Wagner, W.H. Jr. 1971. The southeastern adder's-tongue, *Ophioglossum vulgatum* var. *pycnostichum*, found for the first time in Michigan. The Michigan Botanist 10:67-74.

———, 1973. Reticulation of holly ferns *(Polystichum)* in the western United States and adjacent Canada. Amer. Fern J. 63:99-115.

Wagner, W.H. Jr. and J.M. Beitel. 1992. Generic classification of modern North Americn Lycopodiaceae. Ann. Missouri Bot. Gard. 79:676-686.

Wagner, W.H. Jr. and L.P. Lord. 1956. The morphological and cytological distinctness of *Botrychium minganense* and *B. lunaria* in Michigan. Bull. Torr. Bot. Club 83:261-280.

Wagner, W.H. Jr. and F.S. Wagner. 1980. Polyploidy in pteridophytes. Pp. 199-214 *in* W.H. Lewis, ed. Polyploidy: Biological Relevance. Plenum, New York.

———, 1981. New species of moonworts, *Botrychium* subg. *Botrychium*, from North America. Amer. Fern J. 71:20-30.

———, 1983. Genus communities as a systematic tool in the study of new world *Botrychium* (Ophioglossaceae). Taxon 32:51-63.

———, 1986. Three new species of moonworts *(Botrychium* subg. *Botrychium)* endemic in western North America. Amer. Fern J. 76:33-47.

Walker, S. 1961. Cytogenetic studies in the *Dryopteris spinulosa* complex. II. Amer. J. Bot. 607-614.

Whitmore, S.A. and A.R. Smith. 1991. Recognition of the tetraploid, *Polypodium calirhiza* (Polypodiaceae), in western North America. Madrono 38:233-248.

Yatskievych, G., M.D. Windham, and E. Wollenweber. 1990. A reconsideration of the genus *Pityrogramma* (Adiantaceae) in western North America. Amer. Fern J. 80:9-17.

Zika, P.F. 1988. The status of *Asplenium viride* in Oregon. Amer. Fern. J. 78:72-73.

— BOOK REVIEW —

The Jepson Manual: Higher Plants of California

James C. Hickman (ed.) University of California Press, pp 1400, $65

FRANK LANG

By now most of you have already seen, heard about, or own a copy of ***The Jepson Manual.*** You may know that the University of California Press badly underestimated the demand. The book was out of print by June, two months or so after publication, but still available from some book stores. Hopefully, it will be reprinted by the time you read this review.

There have been some excellent comments and reviews on the book: Rhoda Love (Bull. Native Plant Society Oregon 26(5):48-1149. 1993) and Rudolf Schmid (Taxon 42(2):508-510. 1993.). A spring season of use by my systematic botany students is the basis of this review.

We found the manual to be user friendly and to have many fine features starting with the alphabetical arrangement of taxa. It would have been even better if page numbers were printed after the name in the family key and if a list of families with page numbers graced the inside pages of the front and back covers. Students who used such a list found family descriptions twice as fast as those who did not.

We like the telephone book headings on the pages, the family and the first and last genus on the page. We liked the etymology of generic names, the instant identification of aliens by the different type style of their names, and, of course, the illustrations. As always, we wished for more, but were grateful for those we had.

The illustrations are well executed and for the most part well chosen. Only when the plant we were working on wasn't illustrated did we think otherwise. The artists are to be commended for their skill and draftsmanship.

Students liked the glossary, even without a definition of "glabrous." They found the illustrations very helpful. The simplification of terms, no fronds, alas, may be commendable at one level, but not learning them now makes using older literature more difficult.

One student questioned the inclusion of horticultural information at the expense of other details. Perhaps blooming times and special features like odor would better suit most users. The latter certainly would not encourage, despite bold-faced exhortations against the practice, the taking of wild plants for garden use.

There were some things that surprised us, like the Papaveraceae-Fumariaceae or *Chamaecyparis-Cupressus* lumpings. "Recent detailed studies" are mentioned but not cited when justifying the decision to combine the poppies and the bleeding hearts in one big family. Wolfe (the New World Cypresses. Aliso 1(1):1-250. 1948.) is cited, but Wolfe concerned himself with the traditional cypress species and mentioned *Chamaecyparis* only briefly. Why were these taxa combined? One student considered the marriage of *Chamaecyparis* and *Cupressus* "unforgivable."

Some new keys are excellent, particularly to larger groups like *Carex* or *Salix*. For willows, for example, there is a vegetative key, a key to pistillate plants and a key to staminate plants.

Some keys are less than excellent with vague references, "larger" vs. "smaller," and overlapping characters. "Lf margin wavy, gen ± entire (less often ± serrate)" vs "Lf margin faintly or not wavy, entire to serrate" is a couplet that makes one wonder if you will ever identify your unknown species.

Botanists not brought up on Hitchcock and Cronquist (*Vascular Plants of the Pacific Northwest,* University of Washington Press, 1973) might have trouble with the space-saving abbreviations. For the most part, ***The Jepson Manual***'s abbreviations are obvious and need no explanation, only practice.

The quality of the printing and the paper is excellent and should stand years of heavy use. Although every effort was made to contain the size, the volume is hardly a field manual. If you are concerned about the covers withstanding the abuse of field use, try plastic covers like Crystal Shield Book Savers, available at some large bookstores or library supply companies.

The Jepson Manual has set the standard for floras of the future. The taxonomic treatment of the taxa, their nomenclature and delineation will have influence beyond the political boundaries of California. If you are any kind of botanist you have to own it.

Sadly, James Hickman, chief editor of the Manual, passed away shortly after its completion. Hickman received his BS degree from Oberlin College and a PhD from the University of Oregon. He worked at Washington State University and Swarthmore College before taking a research position at the University Herbarium at Berkeley in 1978. In 1980 he moved to the Jepson Herbarium and in 1982 accepted the responsibility for the new ***Jepson Manual.*** We are grateful for his energy and vision. We hope he took pride in the important role he played in the completion of this monumental undertaking before his death.

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PURPOSE

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